PERSPECTIVES OF THE ASSESSMENTS OF THE FEASIBILITY OF MONETARY INTEGRATION OF THE WEST AFRICAN MONETARY ZONE COUNTRIES

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Declaration for SOAS PhD Thesis

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ABSTRACT

From the perspectives of optimum currency area theory, money and monetary policies, exchange rates determination and exchange market behaviours, this thesis evaluated the feasibility of monetary cooperation in the West African Monetary Zone (WAMZ) through the assessments of the homogeneity of macroeconomic performances and patterns of economic dynamics, business cycles, production structures, factor market flexibilities, financial systems convergence, openness to trade and investments, inflation convergences, money neutrality, monetary-fiscal dominance, monetary reactions, loss of monetary independence, suitability of the future common monetary policy for prospective members, homogeneity of the exchange rate fundamental determinants, currency crisis vulnerability and exchange market pressures. Employing annual, quarterly and monthly macroeconomic and financial data of the WAMZ countries (The Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone), generally spanning over a 36-year period between 1980 and 2015 on the average, the thesis applied various statistical and econometric estimation methods of canonical cointegrating regression, dynamic ordinary square regressions, fully modified ordinary least square regressions, autoregressive distributed lag bound tests, Markov regime switching regressions, ordinary least square regressions, quantile regressions, robust ordinary least square regressions and the generalised autogressive conditional heteroscasticity modelling to gather evidences and draw relevant and useful inferences. Although, there were indications that the zone is not currency crisis vulnerable while monetary dominance was established and money was uniformly neutral and superneutral, there were evidence that the prospective members of the WAMZ generally failed some uniformity and convergence tests of macroeconomic fundamentals and monetary reactions. Some stylised facts and theoretical propositions as well as decisive international parity conditions failed to hold across the WAMZ. Crucial monetary policy tests pointed to the possibility of high degree of influence and domination of the future monetary union by Nigeria, which possesses close to 90% of the economic size of the entire zone. This, with its associated political implications may likely draw back the feasibility of monetary integration of the WAMZ. Further evaluation of the initial design of the European Monetary Union identified design flaws from which lessons were drawn for the African monetary integration initiatives.

Table of Contents

List of Tables **Page**

List of Figures **Page**

List of Abbreviations

ADF- Augmented Dickey-Fuller

AfDB – African Development Bank

AIC - Akaike Information Criteria

AMU – African Monetary Union

ANOVA - Analysis of Variation

ARDL - Autoregressive Distributed Lag

BCEAO - Banque Centrale des Etats d'Afrique de l'Ouest

BEAC - Banque des Etats de L'Afrique Centrale

BEER - Behavioural Equilibrium Exchange Rate

BIS - Bank for International Settlements

BTIR - Bilateral Trade Intensity Ratio

CCR - Cannonical Cointegrating Regression

CDA – Currency Demand Approach

CDF - Cumulative Distribution Function

CEMAC - Communaute Economique et Monetaire de l'Afrique Centrale

CFA – Communauté financière d'Afrique – (meaning -African Financial Community)

CIP – Covered Interest-Rate Parity

CUSUM- Cumulative Sums

CUSUMSQ - Cumulative Sums of Square

DOLS - Dynamic Ordinary Least Square

DPD - Dynamic Panel Data

EAC - East African Community

ECB - European Central Bank

ECI – Economic Complexity Index

ECM - Error Correction Model

ECT – Error Correction Terms

ECOWAS - Economic Community of the West African States

EFSF - European Financial Stability Facility

EGARCH - Exponential Generalised Autoregressive Conditional Heteroscedasticity

EIU - Economist Intelligence Unit

EMCP - ECOWAS Monetary Cooperation Programme

EMP – Exchange Market Pressure

EMPI - Exchange Market Pressure Index

EMU - Economic and Monetary Union

ERM - Exchange Rate Mechanism

ESM - European Stability Mechanism

EU - European Union

FE - Fixed Effects

FD – Fiscal Dominance

FMOLS - Fully-Modified Least Square

FPMM - Flexible Price Monetary Model

FTPL - Fiscal Theory of Price Level

GDP – Gross Domestic Product

GIBC - Government Intertemporal Budget Constraints

GLS - Generalised Least Square

GMM - Generalised Methods of Moments

GS – Gold Standard

HMTR - Hybrid McCallum Taylor Rule

HQIC - Hannan-Quinn Information Criterion

IFE – International Fisher Effect

IFS - International Financial Statistics

IMF - International Monetary Fund

LAD - Least Absolute Deviation

LMN – Long-run Money Neutrality

LMU - Latin Monetary Union

LOLR - Lender of Last Resort

LSMN Long-run Super-Neutrality

MAD – Median Absolute Deviation

MD – Monetary Dominance

MIMIC – Multiple Indicators Multiple Causes

MLE - Maximum Likelihood Estimation

MSA - Markov Switching Approach

MSDR - Markov Switching Dynamic Regression

OCA - Optimum Currency Area

OECD - Organisation for Economic Cooperation and Development

OLS - Ordinary Least Square

PPP - Purchasing Power Parity

QR – Quantile Regression

QTM - Quantity Theory of Money

RE - Random Effects

RER - Real Exchange Rates

RESET - Regression Error Specification Test

RIDMM - Real Interest Differential Monetary Model

RLS – Robust Least Square

SADC - Southern African Development Community

SBIC - Schwarz' Bayesian Information Criterion

SGP - Stability and Growth Pact

SMU - Scandinavian Monetary Union

SPMM - Sticky Price Monetary Model

SSA - Sub-Saharan Africa

SVAR – Structural Vector Autoregression

TGARCH - Threshold Generalised Autoregressive Conditional Heteroscedasticity

TR - Taylor Rule

TSLS - Two-Stage Least Square

UEMOA - Union Economique et Monetaire Ouest Africaine

UIP - Uncovered Interest Rate Parity

UNCTAD - United Nations Conference on Trade and Development

VAR - Vector Autoregression

VECM - Vector Error Correction Model

VIF - Variance Inflation Factors

WACB - West African Currency Board

WACH - West African Clearing House

WAMA - West African Monetary Agency

WAMI - West African Monetary Institute

WAEMU - West African Economic and Monetary Union

WAMZ - West African Monetary Zone

WAUA - West African Unit of Account

WDI - World Development Indicators

Chapter 1

Introduction

1.1 Background

The formation of the European Monetary Union and the introduction of euro in 1999 sparked off the interest of the then Organisation of African Unity (OAU) to develop the desire for the African Monetary Union which aims at the creation of a unified currency (*afro*) for the African Continent as a whole.[1] The continent of African which has the largest number of countries and the largest number of currencies has special initiatives for monetary cooperation within its regions. Nevertheless, there had been several attempts by different African regional economic groupings to form monetary unions in Africa. For instance, there were efforts in the Economic Community of Central Africa (ECCAS) where there is the Central African Economic and Monetary Community which shares single currency within the Central African CFA franc zone, parallel to the West African CFA zone franc shared by members of the West African Economic and Monetary Union (WAEMU). Economists and other analysts consider the step towards a stronger and great African regional integration to be in the interest of Africa because of the small sizes (in terms of economy and population) of many African countries.

Over decades ago, many regional economic groups were evolved in Africa for the purpose of free trade. Some of these regional economic groups still exist till date while some are modifications and rejuvenations of those that were in existence during the colonial regimes in Africa.[2] Nevertheless, there are plans in pipeline for several currency unions within the

[1] The Organisation of African Unity (OAU) had since transformed to the African Union. The Durban Summit in 2002 launched the African Union and convened the first Assembly of the Heads of States of the African Union.

[2] Presently, South Africa's Monetary Area and the CFA franc Zones in Central and West Africa respectively are the monetary integration arrangements that still exist.

regions of Africa as at present. This plan, set out in the 1991 Abuja Treaty, makes an African single currency the African Union's long term goal. Article 44 of the 1991 Abuja Treaty states that "…member states shall within a timetable to be determined by the Assembly (of the Organisation of African Unity), harmonise their monetary, financial and payments policies and boost intra-community trade in goods and services to further the objectives of the community and to enhance monetary cooperation among member states."[3] The African Union Abuja Treaty that established the African Economic Community set out six stages in the process of achieving a monetary union and a single currency for Africa by 2023.[4] The strategy for African monetary integration is based on progressive monetary integration of the activities of the regional economic communities, which are regarded as building blocks of Africa. These economic communities are the East African Community (EAC), the Southern African Development Community (SADC) and the Economic Community of the West African States (ECOWAS).

As a step in the direction of monetary integration of West Africa, the authority of Heads of States and Governments of the ECOWAS at the 1987 Abuja summit in Nigeria, adopted the ECOWAS Monetary Cooperation Programme (EMCP) which entails the adoption of collective policy measures to be fashioned towards achieving a harmonised monetary system and common monetary system management institutions. The medium and long-term objectives of the EMCP are to achieve limited convertibility and to create a single monetary zone in West Africa, with the following characteristics: (i) a common monetary authority; (ii) the issue of a common convertible currency; (iii) the pooling and management of all reserves; (iv) the formulation of a common policy on short-term external liabilities arising from trade

[3] Regional Integration- http://www.uneca.org/aria3/chap1.pdf.
[4] The 1991 Abuja Treaty which was signed on 3 June 1991 and was effective in May 1994 established the African Economic Community.

and balance of payments financing;[5] (v) the adoption of a common monetary policy; and (vi) an agreement on convertibility guarantee.[6] The responsibility of monitoring, coordinating and implementing the EMCP with the focus on the creation of the common currency for the ECOWAS is placed in the hands of the West African Monetary Agency (WAMA). In 1993, the ECOWAS Treaty was revised. The aim of the revised treaty was to accelerate the economic integration process and strengthen political cooperation. With a long term objective of establishing an economic and monetary union between all member countries. This ECOWAS revised objectives caused the formation in 2000, of the second monetary zone when five countries (The Gambia, Ghana, Guinea, Nigeria and Sierra Leone) signed the Accra Declaration that established the West African Monetary Zone (WAMZ).

1.1.1 Monetary Integration of West Africa

The history and experience of monetary integration of the West African region can be traced back to the era of colonialism in the region and also, to the relationship which existed between countries within the region and their colonial masters. In the colonial era, through regional links and with respective currencies of their colonial masters, countries within the sub region were linked with the world economic system. There was distinction between countries which were under the French rule (the Francophone countries) and countries that were under the authority of the British (the Anglophone countries).

For the francophone countries: There was the policy by France to issue currencies linked to the French franc in each of her colonies and these countries were brought together into the French union which maintained its unified economic zone and was later transformed into a monetary union on 26 December 1945. This led to the creation of the common currency, the

[5] The policy on management of medium and long-term debt will however, be the responsibility of each Member State
[6] http://www.comm.ecowas.int/sec/index.php?id=adec020787&lang=en

CFA franc for the former French colonies with the intention of protecting these countries from the effects of the depreciation of the French currency against the dollar in the Bretton Woods arrangements and to ensure the consolidation of the economies of French colonies in the 1940s and 1950s. CFA franc was pegged to the French franc till 1999 after which it was subsequently pegged to the euro. The currency was devalued against French franc by over 17% in 1948 when the parity was fixed at 0.5 CFA franc to 1 French franc and this was changed to 50 CFA francs to 1 French franc during the 1968 French currency reform programme.[7] This devaluation, coupled with economic deterioration and the consideration of the need for convergence and harmonisation of the macroeconomic policies of these francophone countries led to the establishment of two common currency areas for the Central African and the West African francophone countries with each currency area having its own common central bank.[8] The two CFA franc zones are: (i) *Communaute Economique et Monetaire de l'Afrique Centrale* (CEMAC) which is for Central African francophone countries; and (ii) *Union Economique et Monetaire Ouest Africaine* (UEMOA) meant for the West African francophone countries. In effect, there are two CFA franc currencies: (a) *franc de la Communaute Financiere d'Afrique* (XOF - for the West African francophone countries); and (b) *franc de la Cooperation Financiere en Afrique Centrale* (XAF - for the Central African francophone countries).[9] Initially, CFA franc was issued by French's central bank, *Banque de France*. This currency issuing power was later transferred in 1955, to the two regional central banks created for these two regions. These two regional currency issuing banks which were granted independence in 1962 are: (i) *Banque Centrale des Etats d'Afrique de l'Ouest* (BCEAO), serving as the central bank for the West African francophone countries with its headquarters in Dakar, Senegal; and (ii) *Banque des Etats de L'Afrique Centrale*

[7] Factsheet Histoire du franc CFA of the BCEAO.
[8] These common central banks were established in 1994.
[9] The West African CFA countries (Union Economique et Monetaire Ouest Africaine - UEMOA) is made up of Benin, Togo, Cote d'Ivoire, Niger, Mauritania. Senegal, Burkina Faso, and Mali.

*(*BEAC) headquartered in Yaounde, Cameroun serves as the central bank for the Central African francophone countries.[10]

For the Anglophone countries: There were monetary relationships with Britain through the British West African Currency Board (WACB) which had the powers to issue currencies to the British colonies and at the same time control the supply of these currencies to these colonies. As the French West Africa's medium of exchange was the franc and linked at par with French franc, the medium of exchange in the British West Africa was the West African Pound which was linked at par with the British pound sterling. In the colonial years, the West African pound was backed by pound sterling on 100% sterling exchange system and this deprived the countries within the British West Africa of independent monetary policy (Carney, 1961). The British West African Currency Board (WACB) was later dissolved thus paving the way for the British West African countries to sever monetary relationships and links with Britain, take up different respective currencies and establish separate national central banks. It was Ghana that first got independence from the WACB in 1957 and the currency issuing functions was taken over from the Accra branch office of the WACB by Ghana's central bank (the Bank of Ghana) when it started operations in 1958. The Central Bank of Nigeria was established in 1959 (a year before the country's independence) to take over the currency issuing functions. For Sierra Leone, which got independence in 1961, its central bank with the currency issuing functions was established in 1964. However, The Gambia maintained the British West African Currency Board as its currency issuing body until 1971 when its central bank was established.

[10] The two regional issuing banks both issue currencies that are commonly referred to as CFA franc. BCEAO issues the franc de la Cooperation Financiere en Afrique Centrale (XAF) and BEAC issues franc de la Communaute Financiere d'Afrique (XOF).

After independence, French West African countries brought themselves together as the West African Monetary Union (WAMU) and continue to maintain monetary links with France through the French Franc-linked CFA franc and maintained external reserves with France. The West African Monetary Union (WAMU) was changed to the West African Economic and Monetary Union (WAEMU) following the 1994 devaluation of the CFA franc which was later pegged to the euro after its introduction. While Nigeria abandoned the British currency and introduced the naira as its currency in 1973, The Gambia, Ghana, Liberia and Sierra Leone took up dalasi, cedi, Liberian dollar and Leone respectively as their national currencies.With the circulation of the *Communaute Financiere d'Afrique* (XOF) within the West African francophone countries since 1994, members of ECOWAS that are not members of the UEMOA (the non-CFA West African countries) agreed towards future harmonisation of their monetary and fiscal policies with the UEMOA (the CFA West African countries).[11]

In 1999, there was an observation of the slow pace in the implementation of the EMCP. This was attributed to: (a) member states' lack of commitment and political will; (b) lack of policy harmonisation and coordination among the non-CFA franc Zone members and the CFA franc Zone member countries (with the exception of Guinea); and (c) lack of uniformity in the adoption of the macroeconomic framework that were required (Abudu, 2003). The recognition of these obstacles and difficulties prompted the adoption of new approaches that aimed at successful implementation of the monetary cooperation programme during the 22nd ECOWAS Heads of State and Government Summit held in Lome, Togo in December 1999. In order to foster the acceleration of the pace of monetary integration process within the West African bloc, a 'Fast-Track initiative' was introduced by Ghana and Nigeria in December 1999. The Fast-Track initiative was a two-track fast track approach incorporating two-step

[11] UEMOA is also called the West African Economic and Monetary Union (WAEMU).

plan towards the implementation of the monetary union for the whole of ECOWAS. The first step was the resolution of the non-CFA franc Zone member countries (the non-UEMOA) to form a second monetary union. The second step was expected to be the merger (at a future date) of the existing CFA franc Zone (the UEMOA) with the new second monetary union to form an eventual broader monetary union for the whole of ECOWAS. There were consultations with the governments of The Gambia, Guinea, Liberia and Sierra Leone on the Fast Track Initiative after which the Authority of Heads of States and Governments of five ECOWAS countries created, in the sub-region, the second monetary zone known as the West African Monetary Zone (WAMZ) in Accra, Ghana on 20 April, 2000 at a mini-summit where the monetary zone agreement documents were signed (Accra Declaration). It is therefore consequent that there are two monetary groups in the ECOWAS.

1.1.2 The West African Monetary Zone (WAMZ)

Membership of the West African Monetary Zone (WAMZ) launched on 20 April, 2002 was (as at launching) made up of The Gambia, Ghana, Guinea, Nigeria and Sierra Leone. Liberia joined the WAMZ in February 2010 as the sixth member country. However, the WAMZ formally came into existence on 15 December, 2000 when the five countries signed the Articles of Agreement of the zone. The thinking was that the successful launching of the WAMZ would aid the merger with the CFA zone to usher in the ECOWAS single currency, the *eco*. The objective of the WAMZ is to establish a monetary union characterised by a common central bank and a single currency, *the eco*, to replace the existing five national currencies. The WAMZ was originally scheduled to take-off in January 2003. Apart from launching the WAMZ at the 'Accra Declaration', the summit also set up a task force that would look into the process and modalities for the establishment of the West African Monetary Institute (WAMI) which would serve as a forerunner or a precursor for the

proposed common central bank for the West African sub region. The mission of the West African Monetary Institute (WAMI) is "to undertake preparatory activities towards the establishment of the West African Central Bank (WACB), and the launching of a monetary union for the WAMZ. The responsibility of the West African Monetary Institute (WAMI) is to manage the stages of implementation of the WAMZ up to the commencement of the West African Central Bank. While the WAMI is to monitor the macroeconomic convergence programme within the WAMZ, its central role is the preparation of the frame work that will guide the management of monetary policy and exchange rate in the zone as well as other operational matters like bank supervision, currency management and the payment system. The WAMZ implementation programme consists of a set of macroeconomic convergence criteria that member countries are expected to achieve. The successful attainment of these convergence criteria was expected to pave the way for the launching into the monetry integration.

There were four quantitative primary convergence criteria for countries within the WAMZ thus: (i) single digit inflation rate by 2000 and inflation rate of 5% by 2003; (ii) budget deficit (excluding grants) of not more than 5% of GDP by 2000 and 4% by 2002; (iii) central bank financing of budget deficit to be limited to 10% of previous year's tax revenue; and (iv) gross external reserves to cover at least, three months of imports by the end of 2000 and six months by end-2003. Additional six secondary convergence criteria to be observed in support of the primary convergence criteria are: (a) no accumulation of new domestic payment arrears and liquidation of all old arrears; (b) tax revenue should not be less than 20% of the GDP; (c) wage bill should be less than 35% of tax revenue; (d) domestically financed public investment should be at least 20% of tax revenue; (e) the central parity of nominal exchange rate determined on 31 December, 2003 should be maintained with 15 per cent fluctuation

band as defined by WAMZ Exchange Rate Mechanism (ERM-II); and (f) maintenance of positive real interest rates.

A mid-term convergence assessment in 2002 revealed that despite some achievements by WAMZ member countries, these were not adequate enough support the take-off of the monetary union in January 2003. A major problem was the inadequate commitment of member countries of WAMZ to support their expressed commitment with actions. This consequently led to the extension of the WAMZ programme to 30 June, 2005 so that the common central bank and the common currency would take off on 1 July 2005. This failed. Another deadline of 31 December, 2009 was set so that the single currency and the common central bank would be effective from 1 January 2010; and due to same reasons this could not be met. The official excuse for this failure was "the global economic and financial crisis which had put constraints on member state's ability to meet the convergence criteria individually and collectively".The last agreed take off date of 1 January 2015 actually became unrealistic, and eventually, was not met.

For the WAMZ, Tables 1.1 below exhibits the year-by-year attainments of the primary convergence criteria by the six WAMZ countries over the thirteen-year convergence period spanning from 2000 to 2014.

Table 1.1: WAMZ Members' Primary Convergence Criteria Attainments (2000-2014)

Budget Deficit/GDP (….should be ≤ 4%)															
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Gambia	3.6	9.8	9.1	5.2	9.9	8.4	2.7	1.1	4.2	8.6	2.7	4.2	4.6	8.8	9.1
Ghana	10.1	13.2	8.3	7.5	8.1	6.9	12.9	1.4	19.5	12.4	5.9	0.9	5.9	8.2	6.4
Guinea	5.2	3.4	6.2	8.8	5.9	1.6	2.0	0.9	1.7	7.5	14.3	2.9	3.7	3.1	3.9
Liberia	0.9	1.9	1.0	3.7	4.4	0.9	-3.0	3.4	2.0	2.0	-4.2	-0.6	-4.2	-1.0	-2.0
Nigeria	2.7	5.8	5.9	2.8	17.0	1.3	0.6	0.6	0.2	3.3	3.8	5.0	2.6	2.7	1.0
S/Leone	17.3	16.7	16.5	19.4	14.3	9.5	8.5	5.0	7.0	11.0	5.2	5.0	5.6	1.5	3.4
Inflation Rates (….should be ≤5% or 0.05)															
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Gambia	0.2	8.1	13.0	17.6	8.0	1.8	1.4	6.0	6.8	2.7	5.0	4.8	4.3	5.7	5.6
Ghana	40.5	21.3	15.2	23.6	11.8	13.9	10.9	12.8	18.1	16.0	14.7	8.7	9.2	11.6	15.5
Guinea	7.2	5.2	6.1	12.9	27.6	29.7	39.1	12.8	13.5	7.9	15.5	21.4	15.2	11.9	9.7
Liberia	3.2	19.4	11.1	5.0	16.1	7.0	8.9	11.7	9.4	7.8	7.3	8.5	7.7	7.6	9.9
Nigeria	14.5	16.4	12.1	23.8	10.0	11.6	8.5	6.6	15.1	12.0	12.4	10.8	12.2	8.5	8.0
S/Leone	-28.0	3.4	-1.3	11.3	14.4	13.1	7.3	13.8	12.3	12.0	17.1	16.0	12.9	10.4	7.1
Central Bank Financing (….should be ≤10% RF)															
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Gambia	0.0	80.7	22.0	63.1	0.0	0.0	0.0	0.0	35.9	13.7	14.9	12.6	0.4	na	41.0
Ghana	57.9	0.0	12.1	0.0	1.6	0.0	0.0	0.0	17.3	0.0	0.0	10.5	0.0	9.2	11.0
Guinea	24.0	-0.7	24.5	14.6	26.2	-8.8	54.0	0.0	5.8	38.7	91.0	0.0	0.0	0.0	0.0
Liberia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nigeria	0.0	29.3	0.0	19.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
S/Leone	0.0	8.9	0.0	26.4	0.0	0.0	13.3	0.8	0.3	18.6	37.6	1.1	0.0	0.0	7.6
Gross External Reserves (….should be ≥6 months)															
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Gambia	7.5	7.2	2.9	3.1	4.7	5.2	4.9	4.4	4.3	6.5	6.8	6.1	4.8	na	3.7
Ghana	0.8	1.2	2.3	4.1	3.7	4.0	3.7	3.9	2.2	4.4	3.7	3.15	0.03	3.5	4.2
Guinea	2.2	2.8	2.3	1.6	1.2	1.1	0.8	0.4	1.1	1.0	4.2	3.7	3.1	3.4	3.1
Liberia	3.6	2.6	0.0	-0.2	0.2	0.1	0.1	0.7	0.7	0.7	4.3	3.3	2.2	2.4	3.0
Nigeria	13.6	11.3	9.9	8.5	16.1	11.8	15.1	17.4	15.3	13.0	7.9	6.3	9.5	8.9	7.4
S/Leone	2.8	2.3	3.1	1.7	3.3	4.8	4.9	5.1	4.2	6.2	1.9	2.56	2.5	2.1	2.8

Source: West African Monetary Agency and Author's Calculations

The summary of the three-year (2012-2014) averages of the achievements of these primary criteria are presented in the first segment of Table 1.3. In Tables 1.2 below, achievements of five secondary convergence criteria by the WAMZ countries over a 13-year period (2000-2013) are displayed; while the second segment of Table 1.3 below reflects the 3-year (2011-2013) averages of these secondary convergence criteria by the WAMZ countries. On comparative basis, Tables 1.4 below shows the rankings of the WAMZ countries regarding the meeting of the primary and secondary convergence criteria over the3-year periods of assessments. Nigeria and Guinea respectively achieved the number

one spots in the achievements of the primary and secondary convergence criteria while Ghana and Sierra Leone took the last position in each category, respectively.

Table 1.2: WAMZ Members' Secondary Convergence Indicators Attainments (2000-2013)

Tax Revenue/GDP (….should be ≥20%)														
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Gambia	23.3	19.2	14.1	13.8	22.4	17.2	18.8	19.4	17.6	17.5	13.1	13.1	14.1	na
Ghana	16.3	17.2	17.5	19.3	22.4	21.9	22.3	26.1	27.9	21.5	14.1	16.6	17.6	16.6
Guinea	10.2	11.4	12.0	10.5	9.5	12.2	14.8	13.5	14.7	15.2	15.0	15.4	18.9	16.9
Liberia	13.7	11.4	10.7	6.4	9.2	14.7	13.2	12.6	12.5	12.5	24.7	26.4	26.4	19.7
Nigeria	16.7	19.5	14.0	15.7	14.8	17.2	14.9	11.7	16.2	12.0	10.2	13.1	13.5	11.7
S/Leone	10.8	13.4	11.4	16.7	13.7	8.1	8.5	7.8	8.7	9.8	10.3	9.7	10.6	9.0
Wage Bill/Tax Revenue (….should be ≤35% RF)														
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Gambia	30.6	40.1	38.0	33.3	23.1	24.3	24.2	22.3	31.2	33.9	43.5	45.5	43.3	na
Ghana	52.1	52.9	57.2	49.6	46.1	44.8	55.7	51.5	53.8	53.2	48.9	40.6	52.7	6.3.9
Guinea	38.2	32.0	31.0	34.3	32.5	23.2	18.4	25.9	28.0	33.7	38.8	34.1	24.5	27.6
Liberia	24.8	29.0	19.1	26.4	48.0	59.2	34.5	32.9	28.7	35.2	37.0	46.1	46.1	50.0
Nigeria	34.5	26.4	47.2	32.6	33.8	17.9	19.5	31.6	31.2	38.0	39.6	40.9	35.4	37.6
S/Leone	62.0	55.0	63.9	59.7	56.0	65.5	61.6	60.9	56.4	71.7	60.9	58.6	59.2	56.8
Public Investment/Tax Revenue (….should be ≥20% RF)														
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Gambia	6.1	6.1	7.5	11.0	14.2	4.8	3.1	6.3	16.3	16.7	10.6	8.3	7.2	na
Ghana	23.5	16.4	13.2	18.8	18.4	18.8	25.0	27.3	35.8	17.2	14.7	16.8	15.7	11.7
Guinea	7.7	5.5	10.2	12.1	16.1	12.6	12.0	11.9	12.9	38.7	54.1	16.1	38.5	28.9
Liberia	39.7	46.1	47.3	0.0	25.6	18.3	14.9	13.8	12.5	14.7	8.8	14.1	14.1	12.7
Nigeria	29.3	40.3	30.7	21.4	20.3	20.6	20.0	31.2	24.6	39.6	25.4	20.2	14.5	18.4
S/Leone	4.4	6.6	9.4	11.3	8.2	7.9	10.6	9.1	13.2	16.6	40.4	27.9	29.4	22.4
Real Interest Rates (….should be > 0)														
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Gambia	8.8	0.9	0.4	-5.1	6.8	3.2	3.6	-1.0	-1.8	0.6	4.8	3.8	5.2	na
Ghana	1.5	-6.8	-0.2	-13.9	-2.3	-7.5	-9.4	-11.3	-15.9	-6.0	-2.3	2.9	12.0	10.7
Guinea	0.7	2.8	1.3	-8.3	-19.2	-23.0	-20.0	1.8	-0.5	8.1	-9.9	-9.1	11.9	3.9
Liberia	2.6	-13.7	-5.4	-0.6	-12.7	-3.9	-6.2	-9.1	-7.1	-6.9	-4.6	-9.4	-5.7	-5.4
Nigeria	-15.0	4.0	-8.4	-20.6	-5.6	-10.1	-6.5	-3.0	-12.0	-10.0	-7.3	-9.4	-11.2	1.0
S/Leone	9.3	1.3	8.1	-5.8	-6.6	-7.2	-1.8	-8.3	-8.3	-8.5	-13.6	-12.0	-8.9	-2.3
Stability of Real Exchange Rate (….should be ± 5%)														
	2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**
Gambia	0.0	-13.1	-17.5	-27.7	-01.4	6.3	-0.3	9.6	7.5	-10.2	-4.1	-4.5	-4.5	na
Ghana	0.0	1.1	-0.4	0.2	-1.5	10.5	0.6	-0.5	-3.7	-7.4	0.1	-8.7	-14.4	-7.4
Guinea	0.0	-3.2	-2.3	-6.7	-5.8	-22.4	-7.0	32.6	-6.5	4.5	-15.3	-16.6	-2.4	2.1
Liberia	-0.5	-23.2	-30.1	-7.2	-14.2	-3.1	-4.6	2.5	2.7	2.5	-3.3	-4.4	-5.7	-4.0
Nigeria	0.0	11.1	-0.5	-0.51	2.7	15.3	7.3	-1.9	10.8	-6.1	0.8	-6.0	0.7	2.1
S/Leone	0.0	9.4	-13.6	-17.8	-10.7	1.2	1.3	-1.0	9.2	9.3	-12.4	11.7	3.3	1.1

Source: West African Monetary Agency and Author's Calculations

Table 1.3: Three-year Averages of Convergence Indicators Attainments by WAMZ Members

3-year Average of Primary Convergence Indicators (2012-2014)						
	Gambia	**Ghana**	**Guinea**	**Liberia**	**Nigeria**	**S/Leone**
Budget Deficit/GDP (≤4%)	5.7	6.8	3.5	-2.4	2.1	3.5
Inflation Rates (≤5%)	5.2	12.1	12.2	8.4	9.5	10.1
Central Bank Financing(≤10%)	20.7	6.7	0.0	0.0	0.0	2.5
Gross External Reserves (≥6 months)	4.2	2.6	3.2	2.5	8.6	2.4
3-year Average of Secondary Convergence Indicators (2010-2013)						
	Gambia	**Ghana**	**Guinea**	**Liberia**	**Nigeria**	**S/Leone**
Tax Revenue/GDP (≥20%)	13.6	16.9	17.1	24.2	12.8	9.8
Wage Bill/Tax Revenue (≤35%)	44.4	46.6	28.7	47.4	38.0	58.2
Public Investment/Tax Revenue (≥20%)	7.7	14.7	27.8	13.6	17.7	26.6
Real Interest Rates (> 0)	4.5	8.5	2.2	-6.8	-6.5	-7.7
Stability of Real Exchange Rate (± 5%)	-4.5	-10.2	-5.6	-4.7	-1.1	5.4

Source: West African Monetary Agency and Author's Calculations

Table 1.4: Rankings of the Attainments of the Convergence Indicators by WAMZ Members

Rankings of the 3-year Average of Primary Convergence Indicators (2012-2014)						
	Gambia	**Ghana**	**Guinea**	**Liberia**	**Nigeria**	**S/Leone**
Budget Deficit/GDP	5	6	3	1	2	3
Inflation Rates	1	5	6	2	3	4
Central Bank Financing	6	5	1	1	1	4
Gross External Reserves	2	4	3	5	1	6
Member Country's Total	14	20	13	9	7	17
Overall Ranking	*4th*	*6th*	*3rd*	*2nd*	*1st*	*5th*
Rankings of the 3-year Average of Secondary Nominal Convergence Indicators (2011-2013)						
	Gambia	**Ghana**	**Guinea**	**Liberia**	**Nigeria**	**S/Leone**
Tax Revenue/ GDP	4	3	2	1	5	6
Wage Bill/Tax Revenue	3	4	1	5	2	6
Public Investment/Tax Revenue	6	4	1	5	3	2
Real Interest Rates	2	1	3	5	4	6
Stability of Real Exchange Rate	3	6	5	4	2	1
Member Country's Total	18	18	12	20	16	21
Overall Ranking	*3rd*	*3rd*	*1st*	*5th*	*2nd*	*6th*

Source: West African Monetary Agency and Author's Calculations

In general, for both the primary and secondary convergence criteria over the 3-year period, Nigeria gets the number one ranking as Ghana and Sierra Leone share the position at the bottom of the table. Within the context of the convergence indictors, these ranking demonstrates the readiness of the six WAMZ countries for the currency union, from the most-ready (the top ranked) and the least-ready (the low-ranked).

Table 1.5: Rankings of the 3-year Average of General (Primary and Secondary) Convergence Indicators (2010-2012)

	Gambia	Ghana	Guinea	Liberia	Nigeria	S/Leone
Budget Deficit/GDP	5	6	3	1	2	3
Inflation Rates	1	5	6	2	3	4
Central Bank Financing	6	5	1	1	1	4
Gross External Reserves	2	4	3	5	1	6
Tax Revenue/ GDP	4	3	2	1	5	6
Wage Bill/Tax Revenue	3	4	1	5	2	6
Public Investment/Tax Revenue	6	4	1	5	3	2
Real Interest Rates	2	1	3	5	4	6
Stability of Real Exchange Rate	3	6	5	4	2	1
Member Country's Total	**32**	**38**	**25**	**29**	**23**	**38**
Overall Ranking	***4th***	***5th***	***2nd***	***3rd***	***1st***	***5th***

Source: West African Monetary Agency and Author's Calculations

1.1.3 Post-2014 Monetary Integration Developments

As already highlighted, the desire to fasten the process of the monetary integration of the African sub-region was indicated by the 15-member countries of the ECOWAS in 2000. This crystallised into a 2-phase programme for the creation of a single currency for the region. The first phase of this plan was the launching of a single currency to be known as '*eco*' by members of the West African Monetary Zone (WAMZ) while the second phase was the merger of the WAMZ with the existing WAEMU to

evolve a single currency for the whole of ECOWAS member states by January 2020. The WAMZ's single currency failed to take-off and was postponed on three occasions in 2003, 2005 and 2009. In July 2014, due to lack of economic convergence among the WAMZ members, as well as apparent inadequate preparations, glaringly reflecting non-feasibility of the January 2015 take-off, the WAMZ gave up the introduction of the single currency as proposed WAMZ and at the same time took the decision to change focus and re-strategised by relinquishing the initial plan of the WAMZ-WAEMU merger and replacing this with rescheduling of the creation of a single currency for the 15-member ECOWAS countries by 2020. In the bid to accelerate the pace for the introduction of the West African single currency, the Presidential Task Force set up by the Heads of States and Governments of ECOWAS considered three options (as displayed in Table 1.6 below) and eventually recommended that Option 2 (*The Gradual Option*) be adopted. The Gradual Option highlighted that the participation of countries in the single currency will be based on compliance with the primary convergence criteria before 2020.

Table 1.6: Options for Single Currency in ECOWAS

	Options	***Highlights***
Option 1	***Big Bang***	By 2020, all ECOWAS member countries will participate in the single currency; and countries that cannot meet the convergence criteria *ex-ante* will achieve these *ex-post*.
Option 2	***Gradualist***	Member countries of ECOWAS that are able to meet the primary convergence criteria before 2020 will participate in the single currency.
Option 3	***Critical Mass***	The launching of the single currency will take place in 2020 on the condition that the critical mass of countries representing at least 75% of the region's GDP

Source: ECOWAS Commission

The Task Force rejected Option 1 and Option 3 because of the apparent 'too high' levels of risks relating to macroeconomic instability if these two options are adopted. Given the present situations in the West Africa region, Table 1.7 below reflects four possible convergence situations that can result in 2020.

Table 1.7: Possible Convergence Situation in ECOWAS by 2020

Convergence Situation	*Possible Qualifying Countries*	*Possible Outcomes*
Situation 1	WAEMU countries	Current status-quo, leading to a fresh postponement of the ECOWAS single currency.
Situation 2	WAEMU countries + Nigeria + Ghana + few other WAMZ Countries	Launching of ECOWAS single currency.
Situation 3	WAEMU countries + WAMZ countries, but without Nigeria and Ghana.	Fresh postponement of the ECOWAS single currency because of the need to grant more time for the exclusion of the two economic heavy weights (Nigeria and Ghana).
Situation 4	WAEMU countries + WAMZ countries	Launching of the ECOWAS single currency.

Source: Bakoup and Ndoye (2016)

In order to meet the January 2020 deadline and the launching of the single currency as scheduled, those critical measures that were not well addressed in the past were highlighted for full implementation before 2017. These were: (a) preparing a strategy and procedures for the future single currency of the ECOWAS monetary integration; (b) drafting a treaty that will establish the monetary union between member countries of ECOWAS and for all members to ratify this treaty; (c) designing, adopting and ratifying the Article of Association of the future common central bank for ECOWAS. In May 2015, there was the rationalisation of the total number of convergence criteria from eleven to six, consisting of four primary criteria and two secondary criteria. These modifications also involved the reviews and changes in some benchmarks. The new primary criteria are: (i) ratio of budget deficit (commitment basis, including grants) to GDP of less than or equal to 3%[12]; (ii) average annual inflation rate of less than 10%[13]; (iii) central bank financing of budget deficit of less than or equal to 10% of the previous year's tax revenue; and (iv) gross external reserves - higher than or equal to 3 months of imports[14]. The new secondary criteria:[15] (a) stable

[12] Previously, the maximum target for budget deficit/GDP ratio was 4% (excluding grants).
[13] This is against the former maximum of 5%.
[14] The previous cover was 6 months.
15 Criteria removed in the rationalisation exercise were: positive real interest rate, real exchange rate stability, non-accumulation of domestic and external arrears, tax revenue/GDP, wage bill/tax revenue and public investments/tax revenue.

nominal exchange rate of +/- 10%; and (b) ratio of total public debt to GDP of not more than 70%.

1.1.4 Characteristics of the Economies of WAMZ Member States

It is essential to have the understanding and knowledge of the features of the national economies of member states of the WAMZ before attempting to go into an in-depth assessment of the feasibility of the proposed monetary union. This subsection made brief expositions of the salient features of the six national economies within the WAMZ (The Gambia, Ghana, Guinea, Liberia, Nigeria and Sierra Leone). These descriptive analyses cover the demographics, trade, monetary, fiscal, financial, governance and other macroeconomic information.

The Gambia: The Gambia is the 177th largest export economy in the world. The 2014 Economic Complexity Index (ECI) revealed the country to be the 94th most complex economy. The Gambia got independence from the British colonial rule on 18 February, 1965 and the capital city is Banjul while the official currency is *dalasi*. The Gambia is a founding member of the Economic Community of West African States (ECOWAS) in 1975 and also of the West African Monetary Zone (WAMZ) in 2000. As at the end of 2015, The Gambia was the smallest economy and country in the WAMZ (as well as the smallest country in Africa) with 0.26% of the WAMZ's GDP as well as 0.85% of the total population of the zone. The Gambia has a land area of 11, 295 km^2 (4,361 square miles), with a 2015 population projection of 1.991 million. Estimated population density of The Gambia was 176 as at the end 2015. Around 50% of this population lives in urban areas while about three quarters of the population are engaged in farming (traditional subsistence agriculture) in the liberal economy characterised by historic reliance on groundnuts (peanuts) for export earnings, re-export trade built up around its ocean port, low import duties, minimal administrative procedures, a fluctuating exchange rate with no exchange controls, and a significant tourism

industry". The services industry in The Gambia is the largest sector of the economy majorly made up of tourism and foreign banking and by 2016 estimates, this sector accounted for 63% of the GDP, followed by the agricultural sector, which make up to 21.4% of the GDP. The agriculture sector produces peanuts, rice, millet, sorghum, corn, sesame, fish, palm kernels, vegetables, forestry, livestock and fishing and over 75% of the population depends on this sector for livelihood. The industrial sector recorded 15% of the total output. In recent times, economic performances of The Gambia were affected by some shocks (delayed rainfall, Ebola outbreak affecting tourism, weak implementation of economic policy). These contracted the real GDP growth, falling to 0.9% in 2014, rebounding to 4.7% in 2015. Recent years also witness large fiscal imbalances as fiscal deficit moved to 11% of the GDP in 2014 (from 4.4 in 2012). Due to the difficulty in securing external finance, the deficit is hugely being financed through domestic borrowings. There was an increase of 58.29% in public debt over a five year period between 2011 and 2015, causing increase in public debt financing, which in 2015, absorbed 4% of government revenue, an increase from 2.5% recorded two years earlier. All these culminated into balance of payment crisis, putting pressure on the country's international reserves which have significantly been depleted. The government managed to maintain macroeconomic stability in the face of external shocks such as reduction in grant aid and trade revenues, as well as rising oil and food prices'.

The Gambia is a primary commodity exporting country which has sixty seven products on its exports product list. As at 2015, the country's main exports products (with the share of the country's total exports were: (i) cashew nuts (36.6%), wood – in rough (27.6%) and groundnut oil, crude (5%). There are five export products accounting for more than 75% of the country's exports.

Ghana: Ghana was formed from the merger of the British colony of the Gold Coast and the Togoland trust territory. As at 2015, Ghana has a land area of 239.46 km^2

(92,100 square miles) with a population estimate of 27.410 million and an estimated population density of 115. As at independence from British colonial rule on 6 March 1957, about 30% of the population lived in urban areas as against more than 50% by 2015. The capital city of Ghana is Accra while the official currency is *Ghana cedi*. Ghana is a founding member of ECOWAS in 1975 and also of the WAMZ in 2000. As at the end of 2015, Ghana was the second largest economy of the WAMZ, accounting for 9.06% of the economic size of the zone, while it is equally the second largest populated member of the WAMZ with 11.65% of the zone's entire population estimation. The country's export market is the 92nd largest in the world; and according to the ECI, the country is the 122nd most complex economy. Ghana is one of the three WAMZ countries having a stock exchange.

Soon after independence through to 1970s, the Ghanaian economy known to be strong was badly affected by failed development plans and series of military interventions. The economy was highly protected by state investments, particularly in manufacturing sector which in the 1980s, turned to be a heavy burden on state resources. Ghana carried out a currency re-denomination exercise in July 2007 when the unit of account, the cedi was redenominated to the new unit of account now called the Ghana *cedi* with the conversion rate of 10,000 cedis for 1 Ghana *cedi*.

As at now, Ghana is ranked by the World Bank as lower middle income economy. Ghana's natural resources base is diverse and rich. The principal mineral resources include gold, oil, timber, diamonds, bauxite, manganese, and fish while its agricultural products are cocoa, wood (timber), pineapples, cashew, spices and rubber. The dependent of the Ghanaian economy on gold, cocoa (and now oil) makes it vulnerable to movements in world commodity prices. There was a major oil discovery in Ghana in 2001. Oil production formally began in December, 2010 at 55,000 barrel production per day and recorded a growth up to 99,000 barrels/day in 2013. In spite of the oil discovery and wealth of mineral

resources, records as at 2016 showed that agriculture accounted for more than 19.6% of Ghana's GDP (and for around 55% of employment), service, 54% and manufacturing, 24%. Cocoa as a primary cash product provides about 19% of export revenue as at 2014, thus making cocoa, gold and oil as the top three revenue earning export commodities for Ghana. Ghana remains a world's top gold producer and experts' projection is that the country is likely to be the third largest oil producing country in West Africa. Currently, Ghana is aiming at being a major gas exporter.

Guinea: Guinea, which got her independence from the former French colonial masters on 2 October, 1958 is the only French-speaking country in the WAMZ. Its capital city is Conakry. Guinea is a founding member of the Economic Community of West African States (ECOWAS) in 1975 and also of the West African Monetary Zone (WAMZ) in 2000. Guinea opted out of the WAEMU to take up her currency known as *Guinean franc*. As at 2015, Guinea was the 3rd largest economy of the WAMZ (claiming 1.22% of the size of the zone's economy as well as 5.36% of the total population of the zone). The Republic of Guinea, has a land area of 245, 860 km2 (95,000 square miles) with a 2015 population projection of 12.61 million and an estimated population density of Guinea was 51. As at this same period, the country was the 124th world's largest economy and 133rd most complex economy.

Guinea relies solely on the mining sector which provides 95% of export earnings of the country, while agriculture sector provides the remaining 5%. Guinea's natural resources are bauxite, iron ore, diamonds, gold, salt, uranium, fisheries and hydropower. The global demand for bauxite, diamond and gold has caused the Guinean's export share of GDP to rise in recent times. The country has the largest reserves of these mineral resources and untapped high grade iron ore reserves. Though richly endowed with mineral resources, yet, Guinea is in the category of 'poor country'. The outbreak of the Ebola epidemic devastated the economy of Guinea and grossly impacted economic growth (with near-zero growth), caused

budget deficit of over 7% of GDP and constrained the capacity to accelerate development reforms programmes which are essential structural transformation of the economy. Mining, light manufacturing and agricultural processing industries made up to 45.7% of Guinea's GDP while agricultural products of rice, cassava, coffee, banana, potatoes, pineapple, sheep, goats, timber, palm products and cattle made up to 25.8% of the GDP as at the end of 2015. As at 2014, three major export products of Guinea (and their share of the country's total exports) were: petroleum oil (40.4%), aluminum ore (35.6%) and Gold (10.8%). Two export products (petroleum oil and aluminum) accounted for over 75% of the country's total exports.

Liberia: Liberia of today emanated from the Settlement of Freed Slaves from the United States since 1822. On 26 July 1847, when Liberia got its independence, a republic was established by the Americo-Liberians, thus making Liberia the first African country to obtain independence. Liberia has a land area of 111,369 km2 and a July 2015 population projection of 4.503 million. Estimated population density of Liberia was 40 as at the end 2015. The capital city is Monrovia and Liberia's currency is *Liberian dollar*. Liberia is a founding member of the ECOWAS in 1975. Liberia and Cape Verde initially acted as observers in the WAMZ but Liberia finally joined the monetary zone on 16 February 2010. [16] As at 2015, Liberia was the second smallest economy of the WAMZ (after The Gambia) reflecting 0.38% of the zone's GDP and having 1.91% of the zone's population. Liberia is the world's 153rd largest export economy and 129th most complex economy as revealed by the ECI.

Until the 1950s, subsistence farming and rubber production contributed very hugely to the Liberian economy. The discovery of mineral resources like iron ore, gold, diamond, tins changed the fortune of the country and made its economy to place reliance on mining activities. These mineral resources became the significant source of export earnings for the country. The country's economy was largely destroyed by mismanagement and the 14-year

[16] Liberia is <u>not</u> a founding member of the WAMZ.

civil war that started in 1989 and ended in 2003. As a result of the war, many businesses had to leave Liberia with their expertise and capital. Liberia was a major exporter of iron ore before the civil war. The military intervention of 1980 reduced the world demand for Liberia's iron ore. However, with the installation of a stable democratic government many of these businesses have been returning. Around 70% of the country's population and three-quarter of rural workforce are involved in the agricultural sector providing coffee, rubber, rice, cocoa, palm oil etc.

Though, the country is richly endowed with forest, water and mineral resources including good vegetation for agricultural purposes, yet the country is hugely under-developed and it is one of the world's poorest countries. Consequently, Liberia is classified a low income country. 60% of the country's population lives below the poverty line, with poor human capital and poor infrastructures.

With the recent drop in prices of primary commodities (and the effects of the Ebola epidemic), there had been decline in the Liberia's economic growth as evident by sharp fall from 8.7% in 2013 to as low as 0.7% in 2014 and a further drop to 0.4% in 2015. Agriculture however remained the highest contributor to the country's GDP of 42.6% in 2010 and 35.6% in 2014. Nevertheless, in spite of the fragility and poor social conditions after the civil war and prior to the outbreak of Ebola epidemic in 2014, Liberian economy witnessed steady growth up to 8.7% in 2013. The post conflict growth under a regiment of economic stability management and extractive industries' expansion is impressive and laudable.

Three principal export commodities of Liberia (with their percentage share in total exports of the country) are iron ore (40.7%), vessels/floating structures (13.9%) and natural rubber (12.9%). Four products account for more than 75% of the country's exports. The exportation of diamond and timber were banned by the United Nations in the mid-1990s. These bans on the exportation of timber and diamond were lifted in 2006 and 2007 respectively.

Nigeria: Nigeria has a land area of 923.8 km^2 (92,100 square miles) with a 2015 population projection of 182.202 million. This makes Nigeria to be the most populous country in Africa with more than 250 ethnic groups. Estimated population density of Nigeria was 197 as at the end 2015. Nigeria's capital city is Abuja and its currency is *naira*. Nigeria got its independence on 1 October, 1960. Nigeria is the Africa's largest economy (and so the largest and dominating economy in the WAMZ) having overtaken South Africa in 2012 when it posted a GDP of $453 billion (in comparison with South Africa's same year result of $384). The 2012 figure for Nigeria came as a result of the rebasing of the country's GDP (thought by many economists to be long overdue) in order to reflect structural changes in production and consumption within the country.[17] Nonetheless, Nigeria still trails in per capita income and economic development. Nigeria is a founding member of the ECOWAS in 1975 and also of the WAMZ in 2000.

Within the WAMZ, as at 2015, Nigeria was the largest and the dominant economy controlling 88.37% of the zone's GDP as well as the most populated country having 77.48% of the entire population of the WAMZ. As at 2014, Nigeria was the world's 38th largest exporting country and the 125th most complex economy in the world according to the ECI. Nigeria is classified by the IMF as a mixed economy, a middle income country and an emerging market. The country is ranked 20th largest economy (in terms of PPP) and the 21st (in terms of nominal GDP). Nigeria had the largest manufacturing sector in Africa in 2013; and at the same time, produced large proportion of goods and services for the subcontinent of West Africa. These have implications for the WAMZ.

[17] The rebasing took Nigeria to change the base year from 1990 to 2010 as well as increase the number of industries. This resulted in increase in the size of the economy 75%. All economic variables that were expressed in terms of GDP were consequently changed due to the higher nominal GDP.

Historically, Nigeria's economy was agricultural based, yet over 50% of the country's workforce still largely engaged in subsistence farming. The discovery of oil and the growth in the oil industry shifted the focus of attention away from the agricultural sector. Over the past decades, the country's economy had been oil-dependent. Petroleum (the lead mineral resources in Nigeria) provides around 95% of the government revenue as well as foreign exchange earnings for the country. Nevertheless, due to outdated and inactive refineries across the country, Nigeria imports most of her fuel, in spite of around 1.8 million barrel a day oil production. The poor capacity of oil refineries and the neglect of the agricultural sector did not cause Nigerian economy to keep pace with the tremendous growth in its population and this is the reason why the country imports refine petroleum products and food. The large population, long term mismanagement or resources, endemic corruption, long era of military rule are factors of low socio-economic indicators of Nigeria. Despite the huge wealth from oil revenue (and potentials of other natural resources), the World Bank ranks Nigeria as a 'poor country', where the vast majority of the populace lives below the poverty line.

Nigeria's major natural resources are crude oil, natural gas, tin, iron ore, limestone, coal, lead and zinc. The two main export products of Nigeria (and their shares of total exports) are petroleum oil (81.4%) and liquefied natural gas (12.3%). Only one product accounts for more than 75% of the country's total exports and this makes the Nigerian economy is very vulnerable to movements in international prices and demand for oil and gas. In spite of huge dependence on oil, agricultural products still account for up to about 40% of the GDP and around 60% of the total employment. The country's major agricultural products are cocoa, palm oil, yam, cassava, sorghum millet, corn, rice, livestock, and groundnuts. On industrial scale, Nigeria produces hides and skins, crude oil, coal, ceramics, tin, columbite, rubber products, detergents, cement and other construction materials, wood, textiles, beer, food

products, footwear, chemicals, fertiliser and steel. Nigeria has a stock exchange which performs well, although the country's private sector underutilises equity as means of fostering corporate growth. Rural communities still have poor access to credit facilities.
In recent times, the Nigeria's economy witnessed some external shocks. The economy growth of the country fell to 3.0% in 2015, from 6.2% in 2014 while inflation rate increased from 7.8% in 2014 to 9.0 in 2015 and the country eventually entered into economic recession. A major attribute of this is the fall in global crude oil price which led to sluggish growth and slow-down in economic activities impacted by shortages in the supply of foreign exchange.[18]
Sierra Leone: Sierra Leone has a land area of 71,740 km2 (29,925 square miles), with a 2015 population projection of 6.453 million. Estimated population density of Sierra Leone was 90 as at the end 2015. Sierra Leone got independence from the British colonial rule on 27 April 1961. The capital city is Freetown while the official currency is *leone*. After 11-year civil war (1991-2001), democracy and orderliness are slowly being re-established in Sierra Leone. This civil war caused deaths in tens of thousands and displacement of more than 33% of the population. Sierra Leone is a founding member of the Economic Community of West African States (ECOWAS) in 1975 and also of the West African Monetary Zone (WAMZ) in 2000. As at 2014, Sierra Leone was the 136th largest exporting economy and 82nd most complex economy. As at 2015, the country was the third smallest economy of the WAMZ, having 0.79 of the zone's economic size as well as the third least populated country in the zone, with 2.74% of the zone's entire population.

Sierra Leone is very rich in solid minerals resources. The country has one of the largest deposits of rutile in the world. It ranks among the top ten diamond producing countries of the world. Sierra Leone's natural resources include bauxite, iron ore, platinum, gold, manganese, chromites, titanium ore and diamonds. The reliance of Sierra Leone on mining (particularly

[18] Nevertheless, in late May 2017, the IMF announced the exit of Nigeria from economic recession.

diamonds) for its economic prosperity is high. The annual diamond production in Sierra Leone is estimated between US$250–300 million. Exportation of mineral resources remains the country's main source revenue from foreign exchange.

In Sierra Leone, agriculture employs over 80% of the population in subsistence farming. This sector generates about 25% of the export earnings for the country and contributed about 71% of the GDP as at 2015. Rice, coffee, cocoa, palm kernels, peanuts, cashew, poultry, cattle, sheep and fish are the leading agricultural products in this country. Main mineral resource extracts involves diamond, gold, iron ore, bauxite and rutile. Diamond and gold generate 'sufficient' foreign exchange for this country. However, there had been series of off-shore oil discoveries in the country since 2009.

The Sierra Leonean economy witnessed a total collapse from 1995 due to the spill-over of the civil war in the neighbouring Liberia. The economy however began to witness expansion from mid-2000, after continuous decline in GDP from 1980. Despite of her rich resource base, Sierra Leone could be described as a depressed economy with low per capita income over the years. In recent years, the fall in international prices of iron ore (and the Ebola epidemic) caused contractions of more than 20% in the country's GDP, with a decline from 20.1% in 2013 to 4.6% in 2014 and to -21.5% in 2015. As at 2014, three principal exports of Sierra Leone (and their share of total exports) are iron ore (76.8%), diamond (8.1%). One export product (iron ore) accounts for more than 75% of the country's total exports. All the same, the Sierra Leonean economy is also vulnerable to movements in international prices of commodities. The Sierra Leonean stock exchange (one of the stock exchanges in the WAMZ) is at a development stage.

Table 1.8: Financial and Macroeconomic Indicators for the WAMZ Countries (as at 2015)

Indicators	*Gambia*	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*S/Leone*
Real GDP % Growth (2007-2015 average)	3.7	6.7	2.2	6.3	6.0	5.1
GDP (based on PPP) in $	$3.27b	$113.35b	$15.276b	$3.781b	$1,105.34b	$9.832b
GDP (per capita) in $	$1,642	$4,135	$1,212	$840	$6,067	$1,524
GDP (at Official Exchange Rate) in $ 2015	$886m	na	$6.754b	$2.168b	$415.1b	$4.289b
CPI Inflation (%)	6.5	17.2	8.0	7.7	9.0	9.9
External Debt Stock in $	$502.5m	$19.15b	$2.843b	na	$32.27b	$1.403b
External Debt as % of GDP	50.7%	64.4%	29.5%	24.0%	2.1%	33.6%
Exports of Goods (fob) in $	$113.2m	$10.36b	$1.611b	$330.8m	$45.89b	$569.4m
Imports of Goods (cif) in $	$365.1m	$13.47b	$2.173b	$2.232b	$52.33b	$1.575b
Current Account Balance in $	-$136m	-$2.254b	-$1.730b	-$1.014b	-$16.127b	-$475m
Current Account Balance as % of GDP	-20	-8.2	-23.6	-36.9	-3.5	-11.3
Annual Export % Growth (2010-2014)	16.7	-43.3	2.1	0.6	3.8	127.1
Trade Balance in $	-$208m	-$1.403b	-$1.275b	-$1.052b	-$1.576b	-$155m
Budget balance as % of GDP	-9.6	-5.7	-7.5	-5.6	-3.4	-3.7
International Reserves (gold and Forex)	$83.8m	$5.885b	$233.5m	na	$29.07b	
Reserves (excluding gold)	$143.3m	N/A	$233.5m	na	$31.56b	$556.5m
Global Competitiveness Index[19]	3.5	3.7	na	3.2	3.4	3.2
Economic Freedom Index[20]	57.5	63.0	52.1	52.7	55.6	51.7
Monetary Freedom Index[21]	70.8	69.2	66.7	72.2	70.4	68.5
Trade Freedom Index[22]	65.0	64.8	61.2	74.4	63.8	70.2
Investment Freedom Index[23]	65.0	65.0	40.0	40.2	40.0	55.0

Sources: Various and Own Estimations

Some macroeconomic, financial and demographic information on the six WAMZ countries as at the end of 2015 are as displayed in Table 1.8 above.

[19] Global Competitive Index (constructed on a score-scale of 1 to 7) is the measurement of institutions, policies and factors that create sustainable levels of economic prosperity.

[20] Economic freedom provides a measure of absolute property ownership rights, fully realised freedoms of movement of labour capital and goods, as well as absolute absence of coercion or constraints of economic liberty beyond the extent necessary for citizens to protect and maintain liberty (Miller and Holmes, 2011). Economic freedom index is an overall measure of up to 10 specific economic freedoms. Each freedom is based on a score-scale ranging from 0 to 10. A country's economic freedom score is a simple average of its scores on these 10 individual freedoms.

[21] Monetary freedom measures the reliability and stability of currency as a medium of exchange, unit of account and store of value in a monetarily free society in which people finds it easy to create capital and wealth and long term values.

[22] Trade freedom measures an economy's openness to importation of goods and services around the world as well as the ability of citizens to interact freely as buyers and sellers in international markets.

[23] Investment freedom index gauges the absence of constraints on flow of investment capital and the degree to which individuals and firms and market investors are allowed to move their resources into and out of specific activities both domestically and across countries' borders without restrictions.

To reflect the sizes of the economies of the WAMZ countries in the context of nominal GDP and base money as measures, as well as the population of these countries, Table 1.9 below exhibits the proportion (in percentages of the WAMZ total) of these indicators for each country.

Table 1.9: Sizes of the Economy, Base Money and Population of WAMZ Countries

WAMZ Country	% Size of Economy in WAMZ (as measured by Nominal GDP (US$) at end of 2015)	% Base Money in WAMZ (in US$) at end of 2014)	% Population Estimations in WAMZ (as at end of 2015)
The Gambia	0.18	0.50	0.84
Ghana	7.05	11.5	11.76
Guinea	1.26	3.7	5.15
Liberia	0.38	1.91	1.92
Nigeria	90.33	82.5	77.24
Sierra Leone	0.80	0.90	3.09
Total	100	100	100

Source: IMF and Author's Estimation.

1.2 Research Aim, Objectives and Questions

The principal aim of this thesis was to assess the feasibility of monetary integration of the West African Monetary Zone (WAMZ). This fulfilment of this aim entailed the empirical considerations of relevant macroeconomic and finance factors of the member countries of the WAMZ jointly and severally. This caused this researcher to engage in a wide scope of research investigations in three main perspectives of the Optimum Currency Area (OCA theory), monetary and exchange rate behaviour and their associated components as well as carry out detailed survey of architecture of the Eurozone from the view-point of the OCA theory in order to identify design flaws and draw lessons as appropriate and necessary.

Flowing from the research aims, the objectives of this thesis centred on various empirical analyses and evaluation of homogeneities and similarities and other macroeconomic and financial variables and functional relationships: (i) to test the optimality of the WAMZ from the perspectives of the OCA theory and some of its properties towards investigating the OCA theoretical supports (if any) for monetary integration of the WAMZ; (ii) to evaluate the

monetary perspectives of money neutrality and superneutrality , monetary reactions, monetary policy interactions with fiscal policy, suitability of common monetary policy and the degree of loss of monetary independence across the WAMZ; (iii) to assess perspectives of exchange rate behaviour, exchange rate determination and exchange markets pressure. As precursor, further objectives established were: (a) to empirically investigate the validity of some macroeconomic and financial stylised facts and underlying theories in respect of macroeconomic fluctuations and business cycles, Philips Curves, Lucas Output/inflation trade-off, international parity relationships, exchange rates and markets volatilities and banking sectors fundamentals, all in the cases of macroeconomic and financial characteristics of the six member countries of the WAMZ; and (b) to perform a survey of literature on the design of the European Monetary Union (EMU) in light of the OCA theoretical underpinnings and identify any design defects exposed by the financial crisis towards drawing lessons for the WAMZ's proposed monetary integration specifically and the monetary cooperation initiatives of the African continent and other regions of the world at large. Consequently, there were research questions drawn in line with these research objectives. Various answers provided to the various research questions helped in attaining these research objectives appropriately.

Because of the need for similarities in sources of shocks and also symmetric responses to shocks across the WAMZ towards establishing justification for a WAMZ's common monetary policy, research questions for the OCA theory perspectives focussed on the similarities, synchronicities, symmetries and homogeneities of historical behaviour economic variables and relationships relating to some of the OCA properties, with particular focus on economic dynamics, business cycles (classical and deviation), inflation dynamics, production structures, trade openness, financial integration and factor market mobility. These research questions were: (i) Are there uniformities in macroeconomic performances of the WAMZ

countries? (ii) What is the nature of the trends in economic dynamics of the WAMZ countries? (iii) Are there synchronicities of business cycles? (iv) Are inflation dynamics homogeneous in the WAMZ? (v) Are there similarities of production structures? (vi) What are the degrees of trade and investment openness across the WAMZ? (vii) Are there convergence of financial integration and financial systems? (viii) Are labour markets flexible? Answers to these questions provided the inputs needed for the achievement of research objectives of these perspectives and as well, established if the WAMZ satisfied the OCA criteria (to some extent) for the introduction of single currency and common central bank.

Research questions raised under the monetary perspectives were based on the nature of money and monetary policy related factors, neutrality and superneutrality of money, monetary reactions, policy mix (monetary-fiscal policy interactions), loss of monetary independence, and suitability of the expected common monetary policy. Specifically, these research questions are: (a) what are the nature of the behaviours of money and the nature of supply growth toward real variables across the WAMZ economies? Is money neutral and super-neutral? (b) Are the forms and patterns exhibited by the reactions of monetary policy fundamentals to monetary policy across the WAMZ similar enough to guarantee a workable common monetary policy? (c) What is the nature of policy mix (monetary policy interactions with fiscal policy) across the WAMZ? To what extent can the necessary monetary dominance be established in the WAMZ? (d) What would the degrees of loss of monetary flexibilities and independence of WAMZ member countries be in the event of the monetary integration; (e) would the expected common monetary policy be equitably suitable for all member countries of the WAMZ. Answer provided to these questions supported in gathering evidences for the justifications (or otherwise) of the proposed single currency and common central bank.

Research questions raised under the perspectives of exchange rate behaviours are: (i) Are there similarities in exchange rate behaviours, exchange market pressures and exchange rate determination by the fundamentals across the WAMZ? (ii) How uniform are macroeconomic determinants of exchange rates in the WAMZ and their explanatory powers? (iii) in the event of monetary integration characterised by common currency and common central bank, can the pattern of exchange market pressure across the WAMZ justify a common approach in handling currency crisis that may erupt.

Initial research questions asked about the empirical analyses of the general macroeconomic and financial characteristics of the WAMZ countries were on if the empirically established stylised facts and theoretical propositions (relating to the following) are valid in the WAMZ: (a) macroeconomic fluctuations and business cycles; (b) structural relationships in international parity conditions (purchasing power parity and international Fisher effect); (c) Philips Curves; (d) Lucas Output-inflation trade-off; exchange rate and markets volatilities; and (e) banking characteristics.

Answers generated from these were beneficial in producing evidences. Results and findings from the achievements of these research objectives led to the convincing conclusions of the feasibility of monetary integration of the WAMZ. These are novel research efforts because this is the first research exercise (known to the author) to have combined these wider spectrum of extensive studies in the evaluation the monetary integration of an African subregion.

1.3 Significance of the study

Within academic and policymaking spheres, this research work is relevant and significant because of the gaps in research filled by the study as well as the additions to existing body of knowledge every facet of this research offerred in its wider spects of coverage.

This research efforts are unique and significant in drawing inferences about the feasibility (or otherwise) of the monetary integration the WAMZ by going through the investigations and assessments of diversed perspectives of financial and macroeconomic phenomena in the achievement of its aim. This study goes beyond assessments from the view-point of the OCA theories by making a comprehensive evaluation of some monetary and exchange rate behaviour perspectives as well as identifying flaws in the OCA theory and drawing lessons for the African monetary integration initiatives across the world. Specifically, this study brought into the investigation of monetary integration of the WAMZ, some aspects that were not exploited by past researches. Such wide range of investigations on monetary integration feasibility of a geograhical bloc in a single research literature are scare, unique and exceptional. These are novel contributions to monetary integration literature. Significantly, this thesis shed more light into the remaining dark area of monetary cooperation feasibility studies on the WAMZ and the African continent at large.

1.4 Research Philosophy and Design

This research study was design, planned and constructed prior to the commencement of the work, based on deduction process of moving from the hypothesis and theories involved towards inductive generalisation. The thesis was carried out within the positivism methodological viewpoint of research. The study was empirical, logical and objective. It focused on the accumulation and analysis of facts in order to establish explanations. In the spirit of positivism, while empirically assessing the feasibility of monetary integration of the WAMZ countries, the research study sourced for past realities of macroeconomic and

financial facts in the WAMZ countries. These scientific knowledge were seen as testable while predictions were made in order to control economic and social life; thus implying that the research was solely performed through empirical means and not through arguments.

Drawing on the value, precision and measurement principles of quantitative research, this thesis considered the roles of financial and macroeconomic theories to generate explanations based on the assumptions of measurable economic, financial and political realities within the beliefs of unity of scientific methods which considers the logic of enquiry to be uniform across the world of finance and economics**.** These theories were analysed in the context of practices in the WAMZ member countries. Realities were captured through data collected and through the use of various statistical and econometric analysis techniques that were employed. Measures were designed in line with macroeconomic and financial theories and concepts they were meant to denote in the actual sense. This research discovered the existence of objective realities for others to replicate.

The research study embarked upon applied research meant to solve specific research problems and associated research questions, with direct application to the real world. The research work was designed as a quantitative, explanatory, longitudinal (in many aspects) and deductive research study of the WAMZ for the proposed monetary integration of its six members. In addition to this, there was the application of comparative cross-national research design which allowed similarities and/or divergences in macroeconomic variables and research results to be established and analysed in the context of monetary integration of member countries of the proposed monetary zone under assessment.

This research work planned and structured the assessments and investigations of various perspectives of the feasibility of monetary cooperation of the WAMZ countries employed in this research work in forms and ways that the overall aim and objectives of the research

efforts were achieved while answers to the main and various research questions were easily obtained. Time-based plans and outlines of programmes of the research steps taken at every stage of the research process were well laid-out. These guided the researcher in the formulation of research questions, review of theoretical and empirical literature, sourcing of relevant data and other historical information, choice of statistical and econometric tools for data description and analyses, drawing of inference from research analyses and findings and gathering evidences to draw conclusions. Relevant economic and financial models were built while appropriate statistical and econometric techniques were employed in the analysis and evaluation of financial and economic phenomena within the scope of the study and in providing answer to the research questions towards producing empirical evidences that conform to these applied relevant theories and concepts applied in the study. These caused the research findings to add to the existing body of works in economics and finance generally and specifically, in the field of international finance and economics.

1.5 Methodology

Principally, this thesis employed the use of quantitative secondary data. These data are financial, macroeconomic and commodity markets data for the WAMZ member countries. Broadly, these various annual data, quarterly and monthly (including daily exchange rate data) spanning approximately over 1980 to 2015 were sourced from the databases of Economic Intelligence Unit (EIU) of the *Economists*, Datastream, International Monetary Fund, the World Bank and various editions of the statistical bulletins of the central banks of the WAMZ countries as well as the bureau of statistics and offices of statistics in these countries. Data on international commodity price were obtained from the commodity statistics database of the United Nations Conference on Trade and Development (UNCTAD). The analysis of data collected were carried in three major stages: (i) data preparation, (ii) data description and (iii) data processing. The data preparation stage involved the reconciliation

and sourcing for missing and incomplete data and information for the WAMZ countries, cleaning up and reviewing data for inconsistencies by watching for the extreme (outliers) and out-of-range values, statistical and arithmetical adjustments of some data through the applications of various appropriate tools, required weights, percentages, averages, ratios, deviations, leads and lags, logarithmic and differencing conversion of data, and other form data transformations and adjustments. Transformation and adjustments of data into suitable forms for data analysis and expected results were necessitated by specific statistical and econometric purposes and for the aim of meeting some software needs and the adequacy of statistical and econometric models and methods involved so as to avoid bias and misleading results. At data description stage, data meant for analyses were described through the statistical highlights of their characteristics. Measures of central tendency or location (arithmetic mean, median and mode *etc*.), measures of dispersion (standard deviations, variances, range, percentiles, coefficients of variations, coefficients of determination *etc*.), measures of shape of distribution (kurtosis and skewness), measures of statistical dependence (correlation coefficients *etc*.) at one point or the other, were employed in the research work. Further to these, graphical representations of data and results were made with line graphs, bar charts, histograms and pie charts. At data analysis stage, in order to draw relevant inference and meet the research aims and objectives, some statistical tools and econometric estimation methods were employed to estimates times series, cross sectional and panel data involved. Averages, variances, standard deviations, Euclidean distance, analysis of variance (ANOVA), Theil coeffients of inequality, Levene tests of equality of variance and correlation were some of the statistical tools employed. Econometric estimation techniques applied were the methods of ordinary least square (OLS), canonical cointegrating regreession (CCR), dynamic ordinary square (DOLS), fully modified ordinary square (FMOLS), robust linear

square (RLS), quantile regression (QR), autoregressive distributed lag (ARDL), Markov switching dynamic panel data method and Markov regime switching regression method.

1.4 Limitations to the Study

It is necessary to highlight some of the limitations encountered in the process of working towards the achievement of the aims and objectives of this research work. A major limitation was data collection constraints. This is a common and frequent problem across virtually all research studies on Africa. Many African studies lack reliable and consistent data while some of the key data required for research studies are not always available at the desired levels and degrees of frequency, quantity, quality and accuracy. Jarven and Johnston (2015), rightly identified this as 'statistical tragedy in Africa' when they expressed that most research studies on Africa used flawed data made available in different databases. Even from most of the reliable sources of data at national and international levels, monthly and quarterly data were lacking for all the six WAMZ countries covered in this study. Though, quarterly and monthly data were deemed to be more appropriate for these research exercises, these caused this researcher to resort to the use of annual data (which were available as at the time of data sourcing) in most of the statistical and econometric estimations performed in this work. Despite the availability of annual macroeconomic data for the six WAMZ's countries, the non-availability data for Guinea, Liberia and Sierra Leone (and not too often, The Gambia) at this frequency was a specific source of data limitation problems of this study. These were even more evident at national offices of statistics and country official economic and financial databases. These problems were probably due to lack of good record keeping in some cases and could specifically be attributed to the incidence of civil wars in Liberia and the war spill-over into Sierra Leone. Nevertheless, in order to abate the impacts of this crucial constraints of data availability and data reliability on the quality of statistical and econometric

estimations necessary for this study as well as the quality of final output, results and findings of this research, the major use of the Economist Intelligence Unit (EIU) database as the major source of reliable data was resorted to. This database is strongly believed to reflect carefully sourced and processed macroeconomic and financial time series data. However, in spite of this broad availability of reliable macroeconomic data from the EIU database, monthly and quarterly economic data for the WAMZ (as desired and necessary for this research) were still not available in many instances.

Owing to this major limitations, it is necessary to exhibit in charts some key variables and time series data available for various statistical and econometric estimations and analyses performed in this study. These selected core macroeconomic time series as displayed in Appendix 1.1 show various levels of availability (quantity) over different time span as well as various data time frequencies (mostly annual) for the six WAMZ countries.

Although, the availability of some macroeconomic time series across the WAMZ were shown in the charts, these charts also reveal the non-availability (either wholly or partly) of some data over the period of study for four WAMZ countries, in particular. As ways out of these problems, closely related data were sourced to make up for the missing data. For instance, where policy interest rates were lacking, money market rates or deposit rate were used to fill these related vacuums.

1.5 Structure of the Thesis

This research work was structured into seven chapters. Following this chapter which introduced the work as well as laid the background of the study is Chapter Two which displays the review of the concept of monetary integration and the theory of optimum currency area, as well as those of the extant empirical literature on monetary integration and the flaws in European monetary integration. Chapter Three exhibits the investigations of the validity of some macroeconomic and financial stylised facts and theoretical propositions in the cases of WAMZ countries. These relate to macroeconomic fluctuations and business

cycles, international parity relationships (PPP, IFE and UIP), Philips curves, Lucas output/inflation trade-off, exchange rate/markets volatilities and banking sector characteristics. Chapter Four reflects empirical assessments of the perspective of some properties of the OCA theory, which are macroeconomic dynamics, business cycles, inflation, production structures, trade openness, financial system convergence and factor mobility. Chapter Five reports the investigation of money and monetary policy related issues pertaining to money neutrality and superneutrality, monetary reactions, monetary-fiscal policy mix, degree of monetary independence loss and suitability of common monetary policy. Chapter Six presents the evaluation of exchange rate and foreign exchange markets behaviours in the WAMZ, in respect of exchange rate determination and exchange markets pressures while Chapter Seven summarises the entire work, draws conclusions and reflects main findings of the thesis, general contributions to knowledge and the implications of the study for policy.

1.6 Conclusions

This chapter serves as a general background and introduction to this monetary integration study on West Africa by enunciating background information and steps followed in pursuance of the achievement of the research aims, objectives and questions, highlighting aspects covered in the evaluation pointing out the significance of the study as well as methodologies involved in relation to data collection and methods of statistical and econometric estimations employed within the explained research philosophy and design across the seven-chapter research work. These are essential opener of this research reports. The next chapter reports the review of theoretical and empirical literature on monetary integration and evaluates the EMU's monetary integration and its associated design flaws and lessons derived thereof.

Chapter 2

Review of Literature

2.1 Introduction

This chapter reviews extant theoretical and empirical literature on related aspects of the research study. The theoretical review section of the chapter was limited to theoretical expositions of the concept monetary integration and the theory optimum currency area (OCA). In order to establish gaps in literature as well as reveal novel contributions of this research work, the empirical literature review centre on past research works and studies on the prospective monetary integration of the WAMZ and other African monetary integrating blocs (the ECOWAS, East Africa Community (EAC), the South African Development Community (SADC)) and some other selected monetary integrating regions of the world. The OCA assessment of the European Monetary Union was also reviewed in this chapter in order to reveal some design flaws in the establishment of the Eurozone, as lessons for future monetary policy initiative in regions of the world.

2.2 Concept of Monetary Integration

Monetary integration is the last stage in the process of regional economic integration. This is entails the construction of monetary union. It is the unification of exchange rate and convertibility of currency. Broadly speaking, monetary integration is a concept that embraces currency union and single (common) currency area, otherwise known as monetary union. There are four distinctive types of monetary integration as identified in many past studies. These are: (i) a formal exchange rate system with separate currencies and fluctuations in rates of exchange within narrow/zero margins that establishes strong degree of coordination of member central banks is established. The one-for-one link of the South African rand with the currencies of Lesotho, Namibia and Swaziland is a good example of this form of monetary

integration; (ii) dollarization is a form of monetary integration in which a poor/small country unilaterally adopts the currency of a richer/bigger country, and such richer/bigger country is seen as anchor country. With this form of monetary integration, there is no monetary union, but a common currency because the currency issuing country does not consider the monetary and economic objectives of the country being dollarised. The use of the US dollar by a number of countries and dependencies is equally a good example. Practical examples of countries that are dollarised are Ecuador, El Salvador and Panama. In history, many countries have used the currency of their colonial masters as we saw many countries and dependencies used the British pound sterling or French franc one time or the other. These are cases of 'official dollarisation in which the small/poor country loses its sovereign monetary policy right and the ability to control interest rates and exchange rates;[24] (iii) full-blown monetary unions are characterised by common currency, common monetary and fixed exchange rate policies, common central bank (which formulates the union's common monetary policy and issues the common currency to which all the currencies of member countries are convertible), harmonised credit policy and single pool of foreign exchange reserves. Instances of this type of monetary integration are the euro zone and the CFA zones in Central Africa and West Africa and the East Caribbean dollar being jointly spent by some Caribbean countries; (iv) currency boards system entails a country pegging its currency to another currency with zero margins. This link between these two currencies is established by an arrangement in which the amount of money supply in the currency board country is limited to the level reserves held in the second currency.

From observed theories, the coming together of a group of countries (usually in the same geographical location) to form a monetary union should show the following characteristics:

[24] Unofficial dollarisation occurs when the currency of a foreign country circulates widely, but such currency is not the formal national currency (Rose, 2006).

(i) a single central monetary authority which assumes the responsibility of formulating monetary policy for the monetary union; (ii) a single currency; (iii) unrestricted flow of the union's currency among member states; and (iv) the pooling of foreign exchange reserves of member state. When these features are visible and the conditions are fulfilled, it results into a complete monetary integration known as monetary union in which there should be a single currency. Such complete monetary integration has costs stemming from simple relinquishing of national currencies and loss of control over important monetary policy instrument which is the loss of the ability to conduct a national monetary policy by members of the monetary union.

The usual motivation of coming together to integrate and form a monetary union is out of the desire to lower transaction costs that characterise the use of individual currencies and to further bring about reduction or outright elimination of the effects on investment and trade (which may not be favourable). However, price stability or the stability of the value of money is the condition necessary for these potential benefits of monetary unions to be enjoyed. One other motivating reason for monetary union formation is the enhancement of anti-inflationary credibility of member countries' monetary policies. Nevertheless, to a large extent, the condition that informs individual member countries' choice of monetary policy is the choice made about the exchange rate regime. In a fixed exchange rate regime in which the fixation is with a dominant currency, monetary policies that are consistent with the dominating currency would be adopted by all member countries. This somehow reduces monetary independence of the various domestic monetary authorities. Anti-inflationary credibility may however, be attained on the condition that the monetary union exchange rate fixation is with a hard currency in order to command price stability.

There are many institutional arrangement alternatives under which a monetary union's monetary policy could be managed. Firstly, when there is a dominant country, the dominant

country's central bank (which can become the common central bank) may set monetary policy for the union as a whole regardless of whether or not the dominant currency circulates to other member countries. These member countries can get maximised potential benefits if the value of the dominating currency is stable. Secondly, as an alternative, a common monetary authority, a supra-national central bank can set monetary policy for the monetary union.

Going by the above features of monetary integration and other associated attributes like common economic policies, free mobility of goods, capital and people, fixed exchange rates, common institutions and common structural policies, a monetary union therefore translates to an area in which there is an immutable relationship between exchange rates. Through exchange rate mechanisms, several currencies within a monetary integrating region must be fully convertible one into the other at exchange rates that are effectively fixed permanently.

An optimum currency area as the geographic bloc where the benefits to be derived by internal trade through further expansion of the fixed exchange area are balanced by the disadvantages of member countries relinquishing the currency valuation and revaluation freedom. What this implies is that an OCA is an area reflecting the optimum net advantages of monetary integration. These net benefits can be maximised if the area is characterised by labour mobility, factor (price/wage) flexibility, diverse economies of members and high level of trade openness among members. The OCA theory is fully discussed in the next section of this chapter.

2.3 Theory of Optimum Currency Area (OCA)

An optimum currency area (OCA) is also a geographical region in which economic efficiencies are shared and huge economic benefits are created by a single currency depicting a region in which the benefits of forming a monetary union outweigh the cost. Another

consensus description of an OCA is that it is a geographical and economic domain that operates one currency and one monetary policy with a general means of payments either as a single currency or several currencies and whose exchange value are immutably pegged to one another with unlimited convertibility for both current and capital market transactions, but whose exchange rate fluctuate in unison against the rest of the world. This is from the view-point of the concept of monetary integration. In short, an OCA is an area that for optimal balance adjustments and effectiveness of domestic macroeconomic policy, has fixed exchange rates within the area but maintain flexible exchange rates with trading partners.

There are many criteria for deciding the suitability of countries for an OCA. The general agreement among the proponents of 'optimum currency area' is that in such region, labour is very mobile while economies are faced with same forms of economic shocks. The assertion of the OCA literature is that if two or more countries are to share the same currency without experiencing negative effects, and that this is necessary and sufficient to meet the OCA criteria. This is a position grounded with the assumption that nominal exchange rates are very effective; otherwise countries should not abandon their currencies since it would be meaningless to do so. As a major macroeconomic stabiliser, exchange rate affects relative prices of all goods, terms of trade and wages. Therefore, it is necessary for countries coming together to form a monetary union to have some conditions in place so that the functioning of nominal exchange rates to be less fascinating or attractive as an adjustment tool.

The history of the theory of optimum currency area (OCA) dates back to early 1960s when the criteria that should gauge the optimality of a region to have a single currency and form an optimum currency area (OCA) was first formulated by Robert Mundell in 1961 and further developed significantly by Ronald McKinnon in 1963 and Peter Kenen in 1969. These three men contributed the main pieces for an academic debate where common notion has not been found yet, thus making the theory of optimal currency area an unfinished puzzle. In spite of

the fact that Robert Mundell is known as the father of the theory of optimum currency area, (having formulated and named the theory), he was not the first to delve on the issue within the idea of the theory.

The development of the OCA concept came in the context of the discussions of the relative advantages of the fixed exchange rate regime over the flexible exchange rate regime. During the early part of the Bretton Wood System, economists from many angles had various discussions which centre on the result and effect of the fixed exchange regime. Some of their conclusion influenced the theory of optimum currency area (OCA). The OCA theory was developed when the Bretton Wood System of fixed exchange was still in operation. What Mundell did was to determine if it would be optimal for currency of countries to float freely (Mundell, 1961). The predominant focus of Mundell was on areas with a single currency in which the control of money supply would be in the hands of one central bank.

Discussions on the OCA theory and field associated with it can be categorised into two: (i) the Friedman's View; and (ii) the views of Mundell, McKinnon and Kenen. Though, regarded as two groups of opinions, Kawai (1998) however sees Friedman to have opted for flexible exchange rate while Dellas and Tavlas (2009) see Friedman as having a critical view on policies that brings stabilisation at the domestic level in accordance with the traditions of Keynesian economists. In the 1950s, it was generally assumed that Friedman called for flexible exchange rate regime, but Boyer (2009) however regards Friedman as the man who laid foundation for the subsequent theory of optimum currency area.

There are two major phases of contributions to the theory of optimum currency area: (a) the Pioneering Phase (first wave); and (b) the Cost-benefit Phase (second wave). In the Pioneering Phase Robert Mundell (1961), Ronald McKinnon (1963) and Peter Kenen (1969) are the important authors regarded as the traditional contributors of the OCA theory. Notable

authors and contributors in the Cost-benefit Phase (second wave) are Corden (1972), Ishiyama (1975), Tower and Willet (1976) and Mundell (1973).

2.3.1 Labour Mobility and Wage Flexibility - by Robert Mundell

The initial contributions to the theory of OCA were made by Robert Mundell in 1961 when he identified factor mobility as the strategic attribute of an OCA. Mundell's "Theory of Optimum Currency Areas" can rightly be placed in the post-war exchange rate controversy. During the 1950s, there were great criticisms of the Bretton Woods fixed exchange rate system. There were shifts in favour of flexible exchange rates based on two fundamental premises that: (i) changes in exchange rates are more appropriate tools for the correction of imbalances in current account; and (ii) countries have more freedom to pursue their own domestic macroeconomic policy objectives through flexible exchange rates.[25] Mundell (1961), in his OCA paper raised the caution about the workability of a floating exchange rate regime when he identified two logically distinct questions on flexible exchange rate. The first was if flexible exchange system can effectively and efficiently be implemented in the modern world economy, while the second questions was on how the world should be divided into currency areas. The focus of Mundell's article was on the second question pertaining to the domain of a currency area. His major concern was the cost of a common currency when there is a shock within an economy. His OCA theory gives the conditions to be met by countries if membership of a monetary union is to be attractive. This is simply by ensuring that the benefits of going into a monetary union exceed its costs. According to Mundell's theory of OCA, a group of countries within a monetary union will benefit from a common currency if three conditions are met. Firstly, that the member countries within the monetary union should not be hit by shocks that are too asymmetric. This implies that one country within the union

[25] Though there had been further developments and experience pointing out that economies are not insulated by floating exchange rate, but alter the nature of interdependence (Krugman (1989).

should not be hugely or greatly worse-off while other countries within same region are blossoming or booming. The more likely a country could suffer an asymmetric shock, the less the benefit such country will enjoy in being a part of a common currency regime. This is owing to the fact that when a country joins a monetary union and gives up its currency, it equally gives up its autonomous monetary policy.[26] Secondly, that the degree of labour mobility and/or wage flexibility within the union should be high. This condition is a caveat to the first condition and it portends that monetary union member countries that are hit by asymmetric shocks should have a high degree of labour mobility if they want to enjoy the monetary cooperation and continue to be members of the union. The logic is that, due to recession, the rate of unemployment will rise in the asymmetric shock country and the adverse effect of the shock will be minimised if the unemployed in such country can move to other member countries within the union to find jobs. Wage flexibility is a factor that would ease out unemployment if job seekers/workers in an asymmetric-shock-hit country within the monetary union are willing to accept lower wages. This would cause firms to hire workers cheaply, lower prices and make their products competitive.[27] Thirdly, that a decentralised fiscal policy should be in place to ensure the transfer of money or other resources from countries that are performing well within the union to the bad-performing countries within the union. This condition is also a caution about the first condition. This central authority will redistribute revenue (within the union) from countries that are on good standing and to countries that are performing badly.[28] In Mundell's view, there would be less need for monetary policy when the labour factors are more mobile and wages are more flexible. In his summary of Mundell's contributions, DeGrauwe (2005) categorises Mundell's position into three main concepts: (i) symmetry (of shocks); (ii) flexibility; (iii) integration.

[26] Giving up its autonomous monetary policy removes the ability of such country to respond to external shocks.
[27] This is with the prospect of economic stimulation.
[28] Basically, this will help-out member countries that are affected by asymmetric shocks.

The second phase of Robert Mundell's seminal work on optimum currency area and common currency was published in 1973. This work, popularly regarded as 'Mundell II' or 'The Second Mundell'is believed to be an "outgrowth of Monetarism".[29] 'The First Mundell' (the 1961 traditional OCA theory) is seen as very much a Keynesian theory posited that effective stabilisation of the economy can be achieved through the use of monetary policies/exchange rate policies in a world where price and wages are rigid. 'The Second Mundell' was of the view that exchange rates will cease to be a force of stabilisation in a world where the mobility of capital is free (Mundell, 1973). Mundell stressed that exchange rates serves as a factor that destabilises speculative movements and as a result of this, large asymmetric shocks would result. What this implies is that after abandoning an asymmetric shock, exchange rate can be applied as a stabilisation factor. By further implications of position of 'The Second Mundell', membership of a monetary union should be such that should be associated with benefits of eliminating asymmetric shock sources but not that associated with costs caused by loss of exchange rate which ought to serve as mechanism for adjustment.

'The Second Mundell' has another insight that capital markets can only be fully integrated in a monetary union. This centres on the view that capital markets can be made to serve as mechanism for insurance against asymmetric shocks.[30] Thus, a basic position of 'the Second Mundell' is that countries that are outside a monetary union have severe restrictions in their ability to insure against traditional asymmetric shocks and therefore they will have to strive hard to deal with huge asymmetric shocks that are sourced from international capital inflows instability. These analyses consequently made 'the Second Mundell' an advocate of monetary union worldwide.

[29] A basic point stressed in Monetarism is that central banks should be price stability maintenance focused since 'activist monetary policy leads to instability'. Logically, the view of Monetarism points to the position that central banks, in the first place, do not have the capacity to stabilise the national economies, so they have no such capacity to lose when opting to join a monetary union and consequently, to Monetarists, the costs of a monetary union is minimal.

[30] Capital markets in other nations of the world provide insurance against asymmetric shocks and it is hoped that countries that are not within a monetary union cannot benefit from such insurance.

In critical evaluation of Mundell's contributions, Corden (1972) argued that the problem of adjustments in two asymmetric shock countries cannot be solved by the long run capital mobility, though short-run mobility of labour may be valuable. The argument of Grubel (1970) is that because Mundell failed to show the difference between the forms of labour mobility, how Mundell defines a region does not apply to the real world problem. In his own reaction, Ingram (1969) observes that when Mundell defined 'regions', he should have made the definition within the context of capital mobility rather than labour mobility, highlighting further that in an area that is multi-regional, if there is unemployment in one region, the other region must embrace inflation so as to wipe off the unemployment and that different degrees of inflation are therefore expected in the regions.

2.3.2 Size and Openness of the Economy - by Ronald McKinnon

Ronald McKinnon (1963) emphasised on the size and the degree of openness of an economy as a factor that is crucial in an OCA. McKinnon, while agreeing with the idea of Mundell that factor mobility is a determinant of an OCA, complement this idea with another criterion, 'the openness of an economy'. An OCA was further defined by McKinnon as a single currency area within which monetary-fiscal policy and flexible external exchange rates can be used to give the best resolution of three (sometimes conflicting) objectives of full employment, price stability and external balance. While analysing an economy from the view point of trade, blended with openness, he defined the 'degree of openness of an economy' as the ratio of tradable goods to non-tradable goods[31] He identified trade structure as a measure of openness of an economy towards reducing the risk an economy can suffer from shocks.[32] McKinnon develops two economic scenarios: (i) economy with a high level of tradable goods

[31] Tradable goods are exports and imports goods that are produced outside the country and domestically. Non tradable good are those goods produced within the country and which are not involved in international trade.
[32] McKinnon is not the only advocate of "degree of openness" as an OCA criterion. Baldwin and Wyplosz (2009) conclude that countries which are open to trade and which trade heavily with each other would easily form an optimum currency area.

consumption (high degree of openness); and (ii) economy with a high level of non-tradable goods consumption (low degree of openness).

McKinnon's view point was that an OCA must achieve full employment, external balance and internal price stability. In an open economy, variable exchange rates will significantly impact the price level stability because of the high level of tradable/non-tradable ratio and possible devaluation that would increase costs of tradable, and that it is possible to control full employment, external balance; but the increase in cost of tradables will have impact on internal price stability. [33] Thus the argument by McKinnon (1963) was that in an open economy, there is a higher likelihood that the cost of tradables (foreign prices of tradables) will transmit to the domestic price level and domestic cost of living with the effect of reduced money illusion as the exchange rate influences price and wage contract. The implication of this is that exchange rates are inefficient in effecting changes in terms of trade and hence, cannot be useful as adjustment mechanism even if it can influence wage contract and price level. This was the basis for McKinnon to conclude that while a closed economy will benefit from a flexible exchange rate regime, fixed exchange rate is favourable to an open economy; and for this reason, such open economies will not lose much by moving from flexible exchange rate regime to a single currency union.

Therefore, McKinnon's emphasis was that the more the country is open to the world, the lower the benefits of flexible exchange rates. Any exchange rates variation in a highly open country is without any impact on the terms of trade and real wages because the change in the price of the currency will affect both the export price of domestic products and import price of foreign products. One further conclusion by McKinnon was that the adopted exchange rate regime could be influenced by the size of the economy. Hence, a small economy with a high

[33] As previously specified, there are conflicts among the three objectives stated by McKinnon (full employment, external balance and internal price stability).

ratio of tradable goods would derive benefits from pegging its currency to a foreign currency and joining a larger common currency area, whereas a large open economy can maintain flexible exchange rate. This is because such large economy is more self-sufficient and usually, a smaller part of its GDP is engaged in foreign trade and consequently, changes in the exchange rate would influence only a smaller part of its economy.

McKinnon's contributions and his theoretical framework on the theory and property of OCA can fully be recognised within the circle of contributions to discussions on optimal exchange rate. As the Mundell's centre of attention was labour mobility and wage flexibility and other factors that can make exchange rate adjustment to be abundantly useful, McKinnon's attention was towards goods market and the conditions that causes exchange rate adjustments to be ineffective and thus make integration of goods market (in highly open economies) a factor that is necessary and conducive for an OCA.

2.3.3 Diversification of Production - by Peter Kenen

Peter Kenen (1969) introduced 'product diversification' as a more relevant criterion of an optimum currency area. Kenen (1969) said: "diversity in a nation's product mix may be more relevant than labour mobility". His view is that it is impossible for a perfect labour mobility to exist and that an economy that is well-diversified would have diversified export sector and the law of large numbers will come into play and its aggregate export then are sure to be more stable than those of an economy that is less thoroughly diversified. He further highlighted that each industry operating within an economy is vulnerable to external shock and that if these shocks are not correlated, the effects of a positive shock in an industry can be cancelled by the negative shock in another industry, thus affecting stability of the total export. However, diversification may not bring forth stability in the whole export sector if payment imbalance takes its origin from macroeconomic disturbances. Actually, the whole economy

would be affected. Therefore, economies that are well diversified are less vulnerable to external shock and would least require flexible exchange rates to correct external imbalance or maintain external balance. A well-diversified national economy will not have to undergo changes in its terms of trade as often as a single-product national economy (Kenen,1969). Kenen however, gave exceptions to his product diversification criterion: (i) that there may be a small marginal propensity to import; and (ii) that his views does not apply if business cycle swings cause changes in export demand. In the case of a self-sufficient large economy with a small export sector, any exchange rate change would only cause an eventual small overall effect because of the small part of the economy that is being impacted. Therefore, a small economy that does not diversify its product should be more open so as to be able to pay for its import with export revenue. This is a sort of conversion of Kenen's product diversification criterion into McKinnon's openness criterion. Further relevant point raised by Kenen is that the impact of a diverse shock on a common currency area can be lessened by fiscal integration in which there would be fiscal transfers between countries.

2.3.4 The New Theory of Optimum Currency Area

Further to contributions made by Mundell (1961), McKinnon (1963) and Kenen (1969), there are many other inputs into the OCA theory by known economists.

After the emergence of the OCA theory in the early 1960s and through to mid-1970s, researches on the optimum currency area were minimal probably because of the lack of practical monetary cooperation around the world. The emergence of the EMU in the early 1990s sparked the re-birth of the OCA theory as many research interests on the topical issue arose. Developments in international economic theory have revived interests in the OCA theory and "have allowed the original optimum currency area approach to be cast in a new light". The OCA theory had to be revised as progress in economic research was being

recorded. In the opinion of De Grauwe (1992), these new developments in the OCA theory should be regarded as the New Theory of Optimum Currency Areas.[34]

An early acknowledgement that only one criterion should not determine an optimum currency area was made by Ishiyama (1975). His position was that it is necessary for the cost/benefit evaluation to be made before the decision to join a common currency area is finalised. Krugman (1993) identified that among the countries forming a common currency area, inflation rates differentials and wage increase differentials are important criteria that should be considered. He however concluded that the practical problems of monetary reforms and exchange rates policy are addressed by the theory of OCA in little ways. Tower and Willet (1976) opined that when new criteria are included in determining the optimum currency area, such new criteria (which they believed are not specific theories) will show analytical powers of the OCA that delve on the relative costs and benefits of the exchange rates regimes (fixed and floating) for an economy joining the currency area. In much more details, Tower and Willet emphasised the relevance of determining the benefits and costs of a currency area to a country through graphical analyses of the relative net benefits of flexible exchange rates system in comparison with those of a currency area. In the graphical representations, they were able to show that when they are increases in the degree of openness, the benefits of flexible exchange rate will fall, leading to benefits of a currency area; and that with these relationships, it is therefore possible to be at a point where the *statu quo* exchange rate would be outweighed by the common currency area. On the criteria for joining or forming a common currency area, modern theorists added that synchronisation of business cycles as a criterion, with the view that synchronisation of business cycles of proposed member countries of a currency area would reduce the cost of putting in place, individual monetary policy that

[34] A good analysis will reveal that the New Theory of Optimum Currency Areas are more of OCA potential benefits while potential costs of common currency areas are the central focus of the traditional theorists of common currency area.

confronts business and economic disturbances. Literature that identify these include Krugman (1993) and Frankel and Rose (1997), among others.

There had been huge modifications in the theory of optimum currency area as discussions have shifted to expectation formation, credibility and time inconsistency. From time inconsistency view-point, if policy makers and wage setters play game, there may be increase in inflation.[35] It is possible to record reduced costs of lowering inflation if central bank is able to increase its credibility. A traditionally high inflation country can gain credibility by 'tying its hands', that is, pegging its exchange rate to a low inflation country and therefore there is an associated important benefit to a would-be member of a currency union.

Following the earlier literature on 'Discretion versus Credibility',[36] Calvo and Reinhart (2002) concluded that a monetary authority have to acquire credibility for low inflation in order to convince private agents that they are transparent. In the alternative, such monetary authority may adopt a fixed exchange rate regime that is credible in its entirety or rather opt to join a common currency area so as to cancel out the problem of inflation bias. If a country is trying to disinflate, the joining of a common currency area with lower inflation will not cause a problem of difference in inflation rate preference because countries in the monetary union will share the same low inflation goal. However, Gandolfo (1992) acknowledged that inflation similarities are not necessarily a precondition for joining a common currency area, though joining a common currency area might lead to similarities in inflation rates.

The above leads to discussions of the theoretical frameworks on expectation theory, time inconsistency, discretion, credibility and policy rules as developed by Kydland and Prescott

[35] See Barro and Gorden (1983)
[36] Following the earlier literature on 'discretion vs credibility', Kyland and Prescott (1977) and Barro and Gordon (1983) are pioneer writers of papers on discretion and credibility.

(1977), subsequently elaborated by Barro and Gorden (1983) and later by DeGrauwe (1992). According to these contributors, the central point of modern OCA theory is that the monetary integration may results in more benefits when there is high level of inflation divergent, even as the traditional theory of the OCA concluded that inflation convergence is a precondition for an optimum currency area. The reason adduced for this is that a reputation for low inflation rate could be achieved overnight by a high inflation country when such country can accept the control of central bank with (or working towards) low inflation. Kydland and Prescott (1977) highlighted that the optimal control theory would fail where rational economic agents would always want to maintain and adjust future expectations; thus leading to discretionary policy which gives the agents and policy makers opportunity to play either the divergent or the convergent game relative to the mix in policy outcome which is though stable, but not often optimal socially. The effectiveness of monetary policy is another issue raised in modern OCA literature. Though Corden (1972) argued that there would be loss of direct control over monetary policy and exchange rate by a country that joins currency area. This position has however, been contradicted by recent contributors to the OCA theory. Calvo and Reinhart (2002) stressed that the loss arising from giving up monetary policy will not attract a significant cost if such country is unable to use monetary policy effectively and adequately. Mongelli (2002) opined that if exchange rate adjustment mechanism is not active in the actual sense, then the cost of losing exchange rate as an instrument of adjustment is insignificant. The conclusion by Alesina, Barro and Tenreyero (2002) was that the higher the correlation between the costs of shocks between potential member countries of a monetary union, the lower the cost of giving up monetary independence.

Many literature on the theory of OCA are of the political that rather than economic criteria, as an OCA may hinge on long term political commitments of the member states political decision makers. Mintz (1970), emphasised that the most important factor for forming

currency areas is the political willingness of the central authorities to pursue monetary unions. Thinking along this same line, many literature in the 1990s (Bean, 1992; Goodhart, 1996; Feldstein, 1997) shared this same view that political commitments govern the aspirations of the European Monetary Union (EMU) at its formation stage. Making contributions about the aspirations of the EMU, Goodhart (1996) argued that attempting to fix even more rigid, and supposedly irrevocable currency linkages in advance of, and in the absence of, political and fiscal cohesion among the member states, is a dangerous exercise; and further that currency union is essentially a function of political cohesion. In his own contributions in respect of political willingness, Ingram (1969) highlighted that stressing the definition of an OCA may be wasted efforts because in deciding on a country's exchange rate regime, economic considerations would take a "back seat". Neumeyer (1998) posited that the cost of reducing the number of assets held in an economy and the benefits derived when excessive volatility in exchange rates is reduced could lead to the adoption of a currency union. While identifying the difference between political shocks and economic shocks, Neumeyer points out that resources are efficiently allocated through exchange rate fluctuations which reflects economic shock and that the volatility that results from political shocks (non-economic shocks) reduces the degree of financial market efficiency. According to him, "political interference in monetary affairs implies that given the realisation of an economic shock, there is still uncertainty about the future actions of monetary authorities since such actions will be influenced by future political events. The timing of monetary stabilisation in inflationary economies, the value at which currencies enter fixed exchange rate regime and exchange rate realignments are instances of monetary policy decisions that depend on the realisation of political shocks". He interestingly argued further that "currency union and permanently fixed exchange regimes can be viewed as monetary rules that attempts to improve welfare by insulating money from domestic politics".

2.3.5 Endogeneity of the Optimum Currency Area Criteria

The idea that OCA criteria are endogenous was first raised by Frenkel and Rose (1998) when they provided a new and slight dimension to the discussions on the suitability of a country entering a currency union. They argued that because the criteria for an OCA are endogenous, the "examination of historical data gives a misleading picture". This implying that since the use of a common currency will also force countries to be an OCA, analysing the historical fundamentals of two or more countries for these countries to be in tune before the adoption of the same currency is therefore "just part of the movements toward an OCA.[37] Frankel and Rose felt that every decision to commence a monetary union would affect these OCA criteria. Therefore, the economic conditions of a country that could not meet the OCA criteria as at the commencement of the monetary union may change when the monetary union is formed due to the simple fact that such monetary union is formed. Frankel and Rose further conjectured that increased trade in common currency area can cause either increased industrial specialisation between regions, in goods in which they have comparative advantage, which results with in asynchronous business cycles resulting from industry specific shocks; or increased trade can result with increased correlation between business cycles if common demand shocks prevail; or if intra-industry trade accounts for most of the trade. These are positions that favour the endogeneity of the correlation between international trade pattern and international business cycle. The proposition of Frankel and Rose is that "the more highly correlated the business cycles are across member countries of a monetary union, the more appropriate a common currency". They are of the view that countries that join a common currency are moved together or closer to meeting the criteria for the optimum currency area and that there would be increases in the business cycle symmetries of the

[37] In the words of Frankel and Rose (1998), naive examination of historical data gives misleading picture of a country's suitability for entry into a currency union since the criteria are endogenous.

proposed member countries as a result of closer ties in international trade and common monetary policy.

Contrary to the specialisation theory, the point being made by the endogeneity of OCA criteria is that countries are more synchronised when they come together in a currency union. This is because as they are committed to a single currency, they have, by implications, resolved to be long term associates in politics, economics and trade. Due to these commitments, reciprocal trade and foreign direct investments would be facilitated and this would cause more synchronised business cycle. What this means is that at the initial stage, there is no need for countries' business cycles to be synchronised before they can be regarded as an OCA candidates implying that the synchronising process commences after joining the currency union. With this theory, labour mobility need not be as high as required for the theory of specialisation (Frankel and Rose, 1998).

Three different mechanisms that can make the criteria of the OCA to be endogenous were identified by DeGrauwe (2006). Firstly, monetary union can affect trade flows and intensify trade integration, thereby increasing the benefits of the monetary union, Secondly, monetary integration leads to more intense financial integration thereby facilitating insurance mechanism. Thirdly, a monetary union affects the functioning of the labour markets and can potentially increase their flexibility, leading to the reduction in the costs of adjusting symmetric shocks in the monetary union. DeGrauwe's position was that the endogenous mechanism will propel a monetary zone towards an optimum currency area because when a monetary union is formed, the degree of economic trade integration will increase.[38]

Mongelli (2008) identified the endogeneity of the optimum currency area as emerging from two main channels. The first is that the degree of openness (that is, the reciprocal trade

[38] There are many studies to support this position: Rose (2000) and Rose and Va Wincoop (2001) towards drawing conclusions that monetary union positively affects economic integration in very significant ways; thus moving monetary union towards the optimum currency area.

between the member countries of the currency area) is likely to increase after a single currency is launched. This insight is widely accepted. The second channel postulates a positive link between trade integration and income correlation. On this insight, there are divergent views. Many think that monetary unification would instead, spur specialisation and asymmetry of shocks.[39] Further to these, DeGrauwe and Mongelli (2005) revealed three more sources of endogeneity of the optimum currency area as: (i) the endogeneity of product and labour market;[40] (ii) the endogeneity of symmetry of shocks and (similarly) synchronisation of outputs;[41] and (iii) the endogeneity of financial integration or equivalently of insurance schemes provided by capital markets.[42] Mongelli however, identified that the common thread of these sources of OCA endogeneity is that monetary integration represents a removal of borders (very broadly, intended to include also national monies) that contributes to the narrowing of distances and a change in the incentive structure of agents. The theory and evidence are strong to suggest that a monetary union can potentially be moved towards the optimum area by the dynamics of endogeneity (DeGrauwe, 2006). There were further developments of the endogeneity of the OCA criteria as put forward by Corsetti and Pesenti (2002) showing the self-validating nature of common monetary policy as they conclude that the best institutional device to guarantee a credible policy commitment to a monetary policy is to have the monetary union itself in a place.

2.4 Empirics of Monetary Integration

This section, review of some empirical literature on the assessment of some region from the stand-points of the concept of monetary integration and the OCA theory. While emphasis was

[39] Bayoumi and Eichengreen (1977), Mongelli (2005).
[40] Blanchard and Wolfers (2000) and St Paul and Bentolila (2002)
[41] Melitz (2004) and Firdmuc (2005)
[42] Adjuate and Danthine (2003) and Kalemli-Ozcan, Sorensen, and Yosha (2003)

placed on literature relating to monetary regions of African, summary review were made in respect of literature on some selected regions of the world in order to identify gaps in literature and highlight the novel contributions of this research work.

2.4.1 Review on Monetary Integration of the WAMZ and ECOWAS

The first part of this review considers studies that got evidences to conclude about monetary integration feasibility of the WAMZ and ECOWAS. In a study on ECOWAS, Ogunkola (2005) adopted a model of real exchange rate (RER) variability to draw an optimistic conclusion that the sub region of Africa is closer to a monetary union, with a cautious note on the difference between the tangible RER shock variations in the CFA countries relative to the non-CFA zones, while advising that further convergence is desirable. With a gravity model of bilateral trade among countries of ECOWAS, Diop (2007) established substantial gains in trade caused by WAEMU membership and structural factors, concluding that ECOWAS as a monetary union would enhance intra-regional trade, while advocating for macroeconomic policy/action convergences, structural reforms and infrastructural development. Omotor and Nirtingiye (2011) applied a model of simple bivariate variant of the VAR in assessing the WAMZ as an OCA. This study on economic shock symmetries and their effects on member economies suggested the feasibility of the WAMZ constituting an OCA as evident by the similarities in the pattern of variations in the volatility of output growth and inflation of the WAMZ economies; though with some results reflecting 'weak modesty' of the VAR applied for the assessment.

Applying various methodologies, some research assessments of the feasibility of the monetary integration of WAMZ/ECOWAS as currency union got evidences to conclude around 'conditional feasibility'. Debrun et al. (2005) applied fiscal-monetary policy calibration model in analysing and drawing conclusion that the primary obstacle to a viable

monetary integration of the ECOWAS is the lack of fiscal convergence, while suggesting feasibility only for the non-WAEMU countries. Although Debrun et al advocated fiscal heterogeneity to be of benefit to all member countries of a monetary union, they however specifically suggested (as a condition) that the membership of Nigeria in the current monetary integration plans would not offer benefits to other ECOWAS countries involved except plans are incorporated for effective containment of the financial needs of Nigeria. However, beyond the desirability of fiscal convergence, Iyare et al (2005) suggested the establishment of functional payment system mechanism and labour mobility for the success of the proposed ECOWAS monetary union. Ojo (2005) attributed possible failure of future monetary integration of the West Africa to political instability and inadequacy of political commitments with the sub-region, while Obaseki (2005) highlighted lack of a common market needed to complement the monetary integration initiatives of the WAMZ. Sagbamah (2005), taking a cue from the EU (in tune with Ojo (2005)) suggested that ECOWAS needs strong political will, homogeneity of products and financial markets, sound and basic economic structures and infrastructural facilities to transit to a viable monetary union.

The dynamic factor analysis of output fluctuation synchronisation among ECOWAS members by Celasun and Justiano (2005) led to the gathering of evidence to suggest that rather than wider monetary union, the success of monetary integration of the sub-region should be on subsets of countries. This conclusion was drawn from the evidence revealing small countries as having more comparative harmony in output variations. Benassy-Quere and Coupet (2005) evaluated the optimality of the WAMZ, ECOWAS, WAEMU and CAEMU (17 sub-Saharan African countries in all) with cluster analyses and concluded about the ‘economic impracticability’ of the inclusion of Nigeria as part the ECOWAS monetary integration, further suggesting the non-optimality of the WAEMU which could be feasible with The Gambia, Ghana and Sierra Leone thus revealing that the WAMZ should not be

centred around Nigeria. From monetary and macroeconomic stability perspectives, Balogun (2007) came up with a conjecture testing the ineffectiveness of the influence of independent monetary and exchange rate policies on domestic activities (particularly, output and inflation) in the WAMZ and the counter-productivity of these indicators. Findings from this study suggested that domestic monetary policy (captured by money supply and credits to government) hurt real domestic output, thus causing growth stagnation; and that further output expansion could not adequately dampen the fuelling effects of past inflation just as exchange rate devaluation had no effect on growth in the short run, but manifested in domestic inflation in the WAMZ. Balogun (2007) thus got evidence to draw conclusion that under an appropriate monetary union arrangement, the WAMZ countries (as a condition) would be better-off by surrendering their independence over monetary policy instruments to the proposed regional body, just as adverse effects of interest rate on output was established contrary to theoretical proposition of inverse relationship. A cost-benefit analysis of the West African region was made by Masson (2006) to assess the endogeneity of OCA which led to the conclusion that without Nigeria, ECOWAS would be feasible form a monetary union, adding that substantial trade impact among potential member countries could be endangered by a monetary union. However, in the assessment of the same ECOWAS bloc, Masson (2008), performed a welfare gain analysis in which it was concluded that monetary integration would only be feasible on the condition of 'selective expansion'. In same vein, Bangake (2008), applying system of simultaneous equation and GMM to study exchange rate volatility in 21 African countries concluded that the monetary integration of the WAMZ will be feasible with the membership Ghana, but not of Nigeria. Coulibaly and Gnimassous (2013) also concurred with some previous literature on the exclusion of Nigeria from the proposed WAMZ or ECOWAS monetary integration in the assessment of the optimality of monetary union for the West African bloc, employing a 'new estimation methodology catch-

up' co-movement between exchange rate misalignment as well as cluster analysis. While stressing that the WAEMU is the 'most homogeneous' monetary zone, the monetary union could be enhanced with the membership of The Gambia, Ghana and Sierra Leone while indicating Senegal and Ghana as reference member countries for the creation of the monetary union.

Further evaluation of the WAMZ by Balogun (2009) examined the determinants of inflation differentials in a panel study of the WAMZ vis-à-vis the set macroeconomic convergence benchmark since 2000 when the plan to form the currency union commenced. In this study, empirical models based on the theoretical foundations of the New Keynesian underpinnings were estimated leading to the evidence (gathered from a stylised 5-country inflation rate differential model of the WAMZ) that the desired price stabilisation target could not be attained because the unweighted average regional inflation rates varied widely among the WAMZ countries and were often above the single digit target; and that the major monetary policy instruments determinants of inflationary divergence are in the pursuance of distortions in interest rates, exchange rates overvaluation and expansionary monetary policies. These led to the conclusion that the WAMZ countries have a very slim chance of attaining price convergence in the foreseeable future; and that these countries would be better-off conditionally on surrendering their inferior price stabilisation approach to a supranational monetary authority that would have the ability to enforce strict compliance with regional monetary and inflation targets.

Ekpoh and Udoh (2013) rather than making direct analysis of feasibility of a monetary union, focussed on bringing forth those requirements for transition to a monetary union in an exploratory study of the convergence criteria for transiting ECOWAS to a monetary union. They gave analytical perspective of cost of monetary union stability and the loss of specific ability of member countries to stimulate aggregate output with the use of monetary policy and

concluded that monetary integration of ECOWAS is feasible at the price of monetary policy (which is the loss of ability to apply monetary policy to boost output), but on the condition that sound coordination of economic policies and channels of effective risk-sharing are made towards improving the consolidation process of the proposed monetary union. Asongu (2014a) employed cointegration and VECM to assess the REER imbalances and macroeconomic adjustment in the proposed WAEMU and findings revealed that the long-run behaviour of RER in the WAEMU are explained by changes in productivity, terms of trade, investments, and trade openness with evidence of stability of error correction mechanisms in which four (out of five) long run relationships exhibiting the correct signs (thus establishing cointegration), but displaying dissimilar nexus of macroeconomic fundamentals with the equilibrium as shown by the evident substantial cross-country disparities in connections between the RER and these fundamentals. Harvey and Cushing (2015), investigated if the WAMZ is an OCA in a study in which a structural VAR, impulse response functions and variance decomposition methods were applied to gather evidence to conclude that due to the uncommon sources of shocks (caused by diverse country-specific economic structures) and asymmetric responses to common demand, monetary and supply shocks, it is not in the interest of individual members of the WAMZ to go into a monetary union now or in the nearest future unless the economies of these countries converge further. In a study on ECOWAS, Saka et al (2015) got evidence of income convergence overtime when panel least square method was used to estimate beta convergence, but further suggested further integration towards achieving long-run steady growth.

The third strand of empirical literature under review here are those of the studies that concluded that the monetary integration of the WAMZ and/or ECOWAS is impracticable and therefore not feasible. The fiscal-monetary policy interaction analysis of Debrun et al (2005) gathered evident to prove that the monetary union proposed for the non-WAEMU bloc

(principally, the WAMZ) is not feasible for member countries. Houssa (2008) used a dynamic factor VAR model to assess the feasibility of monetary integration of the ECOWAS region and got evidence of 'no feasibility', claiming that from an economic view-point, the integration would be costly due to the asymmetries in supply shocks, although, within the proposed currency area, some positive correlation in demand shocks are evident, but not as relevant as supply shocks because of their temporal effects on output. In another exploratory study of convergence criteria of the WAMZ countries, Cham (2009) investigated if the member states of the proposed monetary zone meet the macroeconomic convergence and the criteria for an OCA with particular focus on openness, output co-movements, inflation, terms of trade and current account balances of member states. The conclusion from the empirical study is that the WAMZ is not a feasible OCA due to significant absence of convergence. Alagidede et al (2012) employed cointegration and fractional cointegration methods to assess inflation dynamics as well as common tendencies in the real output of the WAMZ countries to gather evidence towards the conclusion that the monetary integration of the WAMZ is not feasible because of the substantial heterogeneous inflation and economic trends. Symmetry and/or asymmetry of responses of macroeconomic shock was the method applied by Chuku (2012) in investigating the feasibility of ECOWAS bloc as a monetary union. The study established that 85% of shocks (demand, supply and monetary) within the West African region are asymmetric while external or real exchange rate shocks have symmetric tendency thus making costs to outweigh benefits and consequently portraying the proposed monetary integration of ECOWAS as not feasible. Dufrenot and Sugimoto (2013) used counterfactual analysis and simulations to evaluate single currency proposal for West Africa in a study in which a dependent-economy model for small commodity exporting countries was estimated and applied in comparing some nominal anchor currencies (the yen, the US dollar, the euro and the yuan) that boost competitiveness externally and internally in the event of ECOWAS

bloc's fixed exchange regimes. Corresponding simulation produced evidence of little support for a dominant peg in the ECOWAS region if (a) exchange rate variability is to be minimised; (b) export revenue is to be maximised; and (c) RER misalignment (based on fundamental value) is to be minimised and stabilised. Asongu (2013b) applied granger causality analysis to examine the 'embryonic African monetary zones' at large, in a "short-run Schumpeterian trip". The specific analysis of the WAMZ produced evidence to suggest that the WAMZ is not feasible as a monetary zone because of the 'non-traditional strand of monetary policy regimes for which appropriate policy instruments cannot be used in the short-run to offset adverse output disturbances. In further evaluation, Asongu (2014b) employed GMM in a real, monetary and fiscal policy convergence analysis of the proposed African monetary unions as OCAs. The conclusion that the WAMZ was not feasible as a monetary zone was drawn due to the lack of real, monetary and fiscal policy convergence, implying a substantial absence in the much desired 'catch-up' for policy harmonisation. As extension to previous studies, Asongu (2014c) applied VAR to gather evidence from output and price in establishing how monetary policy would matter in the proposed AMU by coming up with the analyses of how monetary policy affects economic activities in the regions of Africa. The evidence gathered in this empirical study led to the conclusion that monetary integration of the WAMZ is not feasible because of the ineffectiveness of monetary policies as it is evident that the proposed WAMZ cannot use policy instruments to suppress adverse output shocks either through contractionary policy or expansionary policy.

2.4.2 Review on Monetary Integration of the East African Community

Further to the empirical literature review on monetary integration of the West Africa subcontinent, this sub section reflects the review of empirical literature on the feasibility

assessment of proposed monetary integration of the East African Community (EAC). Discussion here are also structured into three categories as in the previous review.

The Generalised Purchasing Power Parity (GPPP) technique was applied by Mkenda (2001) to investigate the optimality of the EAC as an OCA in the study which covered Kenya, Tanzania and Uganda. While the estimated OCA indices yielded mixed results, findings gathered from the GPPP estimations produced evidence to suggest that the EAC is an OCA, given the cointegration of the RERs of the proposed member countries as well as similarities in shocks in estimations using system of simultaneous equation and GMM. Bangake (2008) carried out related study on the EAC (as did for the WAMZ) and got results similar to those in Mkenda (2001). As peformed in the case of the WAMZ, Asongu (2013b) applied Granger causality method in his 'Schumpeterian trip' to the EAC to gather evidence that supports the feasibility of the EAC as a monetary union because it was evident that short term policy instrument can be used in offsetting negative shocks to output. Applying the cointegration technique, Falagiarda (2010), though got evidence to suggest the viability of the EAC as an OCA, there were indications of doubts over the quality of the findings generated by the study due to some statistical and country-specific anomalies. Durevall (2011) assessed the recondition of effective monetary integration of the EAC through costs-benefits analyses as well as other political and institutional preconditions, drawing conclusions that although monetary integration of the EAC is beneficial to member countries, given the following factors of success of such integration: (a) the expected contributions of improved monetary and indirect contributions to economic integration, (b) political will among policymakers (which change of government can easily wipe off), or discontent among influential lobby groups. In evaluating growth correlation and variances in the EAC, the study by Sheik et al (2011) focussed on business cycle investigation in which business cycle and trends were analysed, using cross-country correlation and variance analysis techniques. Investigations in

this study generated the conclusion that EAC member countries (apart from Rwanda) show similarities in cycles and transitory components, but exhibit dissimilarities in the permanent components of growth tendency. A business cycle synchronisation evaluation was conducted by Kishor and Ssozi (2011) employing unobserved component model and time-varying parameter modelling in which finding gathered pointed towards increased rate of harmonisation post EAC Treaty, but weak degree of interrelatedness as evident by small common stock among prospective members. However, in spite of the outcome of the empirical literature discussed up to this point on the EAC, some empirical assessments have raised the conclusion that the monetary integration of the East African sub-region is not practicable.

In the analysis of the cointegration of exchange rates and base money in the evaluation of the monetary integration of the EAC, findings by Buigut (2011) revealed partial convergence with an implication of high costs for prospective members. This necessitates enormous adjustment that will align members' monetary policies to give room for policy coordination tolerance that would enhance the needed convergence essential for the monetary integration to be sustained. Rusuhuzwa and Masson (2012) applied correlation and cointegration methods to business cycles and shocks to evaluate the design and implementation of the OCA properties in the EAC in a costs-benefits analysis and showed that the EAC countries exhibited asymmetric shocks, differences in production structures and difficulties in meeting convergence criteria (particularly, that of fiscal deficits). Also, using the structural VAR method, Mafusire and Brixiova (2013) had the absence of macroeconomic convergence as the basis to draw the conclusion of monetary integration impracticability in the EAC and advised against quick transition of the EAC to a monetary union.[43] Equally, Davoodi et al (2013) applied SVAR in the EAC monetary integration evaluation which was based on the

[43] This advice was based on the adopted 2015 take-off date.

analysis of the effect monetary policy on inflation and output in the prospective member countries. Findings from this study led to the conclusion that currency union for the EAC is not workable due to the conflicting monetary policy transmission mechanisms with a reflection of ineffectiveness of mainstream monetary policy instruments. Lepetit et al (2014) used a stylised 'model of policymakers' decision problems' which allows for uncertainty in rewards from macroeconomic (fiscal and monetary) and financial stability. The conclusion raised by the research work indicated that for all the EAC member countries (apart from Rwanda – for fiscal stability), uncertainty does not guarantee successful monetary integration, particularly from the standpoints of monetary and financial stability. In a study that hugely aligned with Davoodi et al (2013), the method of VAR was adopted by Asongu (2014c) to generate findings evidencing the general ineffectiveness of monetary policies in affecting output and prices in the EAC countries, thus making monetary integration of the economic bloc to be viable. When the GMM technique was applied for further study on the EAC by Asongu (2014b) to test convergences of real, monetary and fiscal policies, evidence gathered from the evaluation suggested that the EAC is not an OCA due to the lack of real, monetary and fiscal policy convergences in the EAC countries assessed. Drummond et al (2015) dealt with identifying the susceptibility of the EAC economies to asymmetric shocks, assessing exchange rate as shock absorber, reviewing the risk-sharing mechanism essential for successful monetary integration, considering the likely structural changes in the EAC economies (such as new oil discoveries) and checking the intrinsic endogeneity of further monetary integration of the East African economies. Applying dynamic regression, cluster method based on principal component analysis, SVAR, impulse response function and variance decomposition methods, findings from this empirical research showed that though there are some similarities in the structures of the EAC economies, shocks over past decades are country-specific and cross-country economic growth rates lack synchronicity indicating

limited economic convergence. The evidence of dissimilarities across these economies as revealed by the cluster analysis points to the conclusion that EAC is not an OCA. For all countries (apart from Burundi), exchange rate absorbed asymmetric shocks thus necessitating the need for additional tools for further economic stability if country-specific (nominal) exchange rate seizes to serve as shock absorber. Further findings from this study revealed that exchange rate shocks are sources of disturbance to inflation, but with no material effects on output.

Going further, the review of empirical literature on monetary cooperation in the South African bloc of Africa are discussed in the next subsection, under the three strands adopted for this and previous reviews.

2.4.3 Review on Monetary Integration of the South African Monetary Bloc

The assessment of the South Africa's Common Monetary Area (CMA) as an OCA and the costs-effects analysis of membership of the CMA were performed by Grandes (2003) who applied cointegration and costs-effects analysis methods to identify common long run trends which asserted that the CMA is an OCA exhibiting common long term tendencies in their bilateral RER and high levels of openness and common diversification which would impact the monetary integration positively. Patroba and Nene (2013) also evaluated the readiness of the CMA members for a monetary union through the evaluation of the established convergence criteria and concluded that it will be beneficial for the CMA to form a monetary union. Debrun and Masson (2013) carried out a quantitative welfare gain analysis of the SADC to assess the welfare impacts from the CMA (though, extended to some SADC countries) and got evidence to establish that: (a) the symmetry in SADC economies will benefit all member countries (apart from Mauritius); (b) all members of the SADC (apart

from Angola, Tanzania and Mauritius) will benefit if they join the CMA; and (c) it will be beneficial for all members of the CMA to participate in the monetary cooperation.

Within the 'conditional feasibility' strand, Khamfula and Huizinga (2004) examined divergences in fiscal and monetary policies of the SADC countries by employing the use of a GARCH model of RER of these SADC member currency against the South African currency to reveal RER shocks. Findings here revealed evidence to suggest that although variations in the RERs (caused by country-specific monetary policies) would be hugely eliminated by monetary integration, not all members of the SADC should form the monetary union due to how the benefits of joining are outweighed by the cost of joining. The degree of the convergence of interest rates, inflation and exchange rates within the SADC was examined by Jefferies (2007) who observed heterogeneities in full labour and capital mobility, huge political constraints and intra-regional trade and evidence to suggest 'selective expansion' in which member countries are stratified into two groups (i) core convergence group; and (ii) non-convergence group. When Wang et al (2007) investigated the feasibility of the monetary integration of the CMA by applying integration convergence as well as shock and adjustment analyses, they got the proof of feasible monetary integration, which is conditional upon more symmetries in responses to shocks within the bloc. Going against the findings and conclusions in Khamfula and Huizinga (2004), Bangake (2008) came up with the application of GMM and system of simultaneous equation to evaluate monetary integration in some Sub-Saharan Africa (SSA) and concluded that structurally within the SADC, monetary integration is only feasible between three countries (Malawi, Zambia and Zimbabwe). A recent study of eleven SADC member countries by Zehirun et al (2015) applied cointegration and VECM to gather evidence that the G-PPP hypothesis holds for SADC members (except Angola and Mauritius) thus indicating the feasibility of monetary cooperation in SADC without these two countries.

The only known empirical investigation of the South African bloc which concluded that monetary integration is not feasible for the economic bloc was undertaken by Agbeyegbe (2009) who performed time-varying estimation of convergence of macroeconomic and monetary indicators to gather an evidence of non-convergence in CPI inflation and nominal exchange rate within the SADC, thereby suggest the non-viability of monetary integration of countries within the SADC.

The end goal of the monetary integration of African sub-region is the achievement of the establishment of an African Monetary Union (AMU) for the Sub-Saharan African (SSA) countries. Therefore, it is important to conclude the review of literature on the proposed monetary integration of African regions by analysing some existing literature assessing the feasibility of the AMU initiatives. These are discussed in the next subsection.

2.4.4 Review on Monetary Integration of the Sub-Saharan Africa

An exploratory politico-economic analysis of the SSA was made by Guillaumen and Stasavage (2000). The investigation found out that monetary integration is the panacea for sound commitment towards macroeconomic policy implementation since Africa lacks political institutions that can guarantee credible commitment towards establishing financial stability. The study recommended the design of monetary unions if better policies are to be instituted in maximising effective enforcement of monetary rules. Tsangarides et al (2006) employed a tobit gravity model to gather evidence leading to the conclusion that in terms of substantial trade benefits, membership of AMU would be beneficial. Yehoue (2005) analysed the co-movements of output and price, inflation and trade using historical data of 53 African countries to draw the conclusion that the journey to an AMU would be gradual without essentially evolving a common currency for the continent as a whole. This implies the feasibility of the three economic blocs of Africa as monetary unions, but not for the continent

Africa. An augmented gravity model that included measures of currency unions and pegged regimes was built by Tsangarides and Qureshi (2015) to generate results that suggested that the effects of conventional peg is large as that of currency unions in Africa, and that currency unions (and direct pegs) promote bilateral trade in Africa. What these connote is that African countries stands to benefit from fixed exchange regime and that these benefits are comparable to those derivable from typical monetary integration.

Bayoumi and Ostry (1997) analysed sizes and correlation of intra-regional trade real cross-country disturbances in the SSA in investigating the consistency of currency arrangements in SSA with OCA theory. The study got evidence to suggest that SSA as a whole is not feasible for monetary integration because of the little proof of rewards for larger currency union in the nearest future. Karras (2007) carried out macroeconomic costs-benefits analysis in a study of 37 African countries. The empirical findings in the research work revealed heterogeneous benefits of monetary cooperation across the continent. When the empirical results were applied in comparative analysis of net benefits for individual countries, it showed that Nigeria in more a promising candidate for AMU membership, even more than Kenya, the largest economy in the EAC.

2.4.5 Summary on Monetary Integration of Some Regions of the World

Further efforts were made in this chapter to essentially survey the OCA and monetary integration empirical literature on some other regions of the world including Asia, Gulf, Latin America, the Caribbean, North America and the United States regions. Table 2.1 below summarises the empirical literature on the feasibility as an OCA, the ten-member Association of Southeast Asian Nations, with extension to Asian Big Three (China, Hong-Kong and Japan); the East Asian bloc, and South East Asian region.

Table 2.1: Summary of Empirical Literature of the Feasibility of Monetary Integration of Asian Countries

No	*Author (s)*	*Region*	*Methodology*
1	Bayoumi & Eichengreen (1994)	9 Countries	Blanchard-Quach extraction technique to extract and quantify demand and supply shocks; and pair correlation of shocks to determine degree of integration using EMU as benchmark.
2	Eichengreen & Bayoumi (1999)	8 Countries	Regression of exchange rate volatility and output variability and correlation analysis.
3	Loayza, Lopez & Ubide (2001)	7 Countries	Error components model decomposing real value-added growth to assess shocks and co-movements of shocks.
4	Yuen (2000)	East Asia	Hierarchical clustering of some macroeconomic indicators.
5	Bayoumi & Mauro (2001)	9 Countries	Analysis of size and speed of disturbance, using EMU as benchmark.
6	Ngiam & Yuen (2001)	9 Countries	Using Bayoumi & Eichengreen (1994) methodology, but without the use of impulse response function and EMU as benchmark.
7	Lee, Park & Shun (2004)	10 Countries	Dynamic factor model of common shocks and output co-movements.
8	Kawai & Takagi (2005)	East Asia	SVAR model to study the impulse response function of real output and price to depreciation of exchange rates.
9	Kawai & Motonishi (2005)	11 Countries	Correlation analysis of real variable activities.
10	Font-Vilalta & Costa-Font (2006)	5 Countries	Correlation study of the synchronisation of exchange rate. Business cycles, interest rates, exports and imports.
11	Ahn, Kim & Chang (2006)	ASEAN 4	GPPP model of RER (Japan as reference currency) to study pattern of responses to shocks.
12	Sato and Zhang (2006)	8 Countries	Cointegration tests in assessing real output co-movements; including Vahid tests and Engle tests.
13	Nguyen (2007)	10 Countries	Fussy cluster analysis of synchronisation of some OCA properties (business cycles, volatility of RER, openness and inflation differentials).
14	Rana (2007)	11 Countries	Analysis of 10-year moving correlation of real output growth of assessed countries and the group as a whole.
15	Jeon & Zhang (2007)	North East Asia	SVAR model of macroeconomic shocks to analyse the correlation of the extracted shocks.
16	Bacha (2008)	12 Countries	SVAR and correlation analysis of some macroeconomic indicators and variables
17	Ibrahim (2008)	7 East Asian Countries	Hierarchical and fussy clustering method to assess OCA and 'adjusted' Maastricht Treaty convergence criteria.
18	Kawai (2008)	10 Countries	Multi-facet study on various aspects of the region's integration and comparative analysis of the region with the post-Euro EMU and other parts of the world.
19	Sato, Zhang & Allen (2009)	ASEAN 5 & Japan	Johansen cointegration analysis of long-run co-movement of real output.

20	Quah (2009)	17 Countries	Comparison of OCA properties in Asia with those of the EMU and dollarised economies.
21	Han & Lee (2010)	East Asia	Analysis of OCA (incorporating post-crisis structural changes) and composite index of OCA criteria.
22	Volz (2010)	East Asia	Combination of theoretical and empirical tools to analyse various policy options.
23	Lee & Azali (2012)	East Asia	Bayesian state-space technique for shock symmetry assessment.
24	Kawasaki (2012)	East Asia	GPPP model of RER to assess equilibrium relationships and common trends.
25	Lee & Koh (2012)	East Asia	SVAR method to assess the nature of macroeconomic disturbances.
26	Sharma & Mishra (2012)	East & South Asia	Cointegration analysis of real output, impulse response and decomposition analysis of shocks and GPPP model analysis of RER movements.
27	Alvarado (2014)	ASEAN& ASEAN +3	Construction of OCA indices to assess OCA properties.
28	Navarro (2015)	East Asia +3	Simple analysis of OCA properties (factor mobility, openness and product diversification)

Sources: Author's compilation and various literature.

Highlights of empirical studies and methodologies employed in some extant literature on the feasibility of monetary union in the Gulf Cooperation Council (GCC)[44] are summarised in Table 2.2 below.

Table 2.2: Summary of Empirical Literature of the Feasibility of Monetary Integration of the Gulf Cooperation Council (GCC) Countries

No	***Author (s)***	***Methodology***
1	Kamar & Bakardzhieva (2006)	Cointegration method of Engle-Granger and dynamic ECM to estimate the model of RER and its macroeconomic determinants.
2	Abu-Qarn & Abu-Bader (2008)	SVAR to assess degree of shock asymmetry and test for common trend and common business cycles.
3	Kamar & Naceur (2007)	Pooled Mean Group method to assess the long run determinants of RER behaviour.
4	Buiter (2008)	Exploratory analysis of economic, political and institutional criteria.
5	Thorpe (2008)	Exploratory costs-benefits analysis.
6	Benbouziane & Benamar (2010)	Multivariate threshold autoregressive (MVTAR) model and generalised response functions to estimate shocks symmetries.
7	Loius, Balli & Osman (2012)	Bivariate SVAR with long run restrictions to assess symmetries in aggregate non-oil supply shocks.

[44] The GCC six member countries are Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and United Arab Emirate.

8	Kandil and Trabelsi (2012)	Multivariate SVAR method to capture patterns of shock co-movements.
9	Alshehry & Slimane (2013)	4-variable SVAR based on Blanchard & Quah (1989) to identify structural shocks symmetries and some informal tests based on OCA criteria.
10	Marzovilla (2014)	Analysis of OCA criteria to assess cost implications of single currency.
11	Gulzar (2015)	Multidimensional scaling (MDS), Scree Tests, regression, and correlation analysis to assess macroeconomic and financial factors relating to Islamic beliefs; and Hofstede Cultural Index to evaluate cultural homogeneity
12	Hamid, Ali and Sbia (2015)	Panel cointegration, FMOLS, DOLS, CCR techniques to assess cointegrating long run equilibrium relationships between money demand and its determinants.
13	Medhioub & Jedida (2017)	Temporal correlation to analysis of business cycle synchronisation.
14	Essaadi (2017)	Time-varying coherence function to test co-movement dynamics and synchronisation of business cycle.

Sources: Author' compilation and various literature.

Table 2.3: Summary of Empirical Literature of the Feasibility of Monetary Integration of Latin American and Caribbean Countries

No	*Author (s)*	*Region*	*Methodology*
1	Bayoumi & Eichengreen (1994)	Latin America (and some world regions)	VAR of supply and demand disturbances to assess symmetrical distributions across regions.
2	Eichengreen (1998)	MERCOSUR[45]	Regression of alternative measures of exchange rate volatility on four OCA criteria.
3	Grabows & Horvath (1999)	CARICOM[46]	SVAR to assess exogenous shock symmetry.
4	Kendal (2000)	CARICOM	Cointegration and time-varying parameter (Kalman filter) analysis to test exchange rate convergence.
5	Edwards (2006)	Latin America	Probit modelling of sudden stops and current account reversals in investigating the probability of these adverse events on membership of currency union.
6	Moreira & Mendoza (2007)	CARICOM	Canonical gravity model of intra-regional trade to assess the viability of monetary integration.
7	Foresti (2011)	Latin America	SVAR estimation of pattern and similarities of temporal shocks.
8	Ghartey (2008)	CARICOM	VECM and cointegration methods to assess economic shocks
9	Augustine (2008)	CARICOM	Simple correlation and concordance statistics of Harding & Pagan (1999) to examine business cycle synchronisation.
10	Augustine & Hunte (2008)	Selected Caribbean	Kalman filter method to derive time-varying estimates of degree of shock convergence.

[45] MERCOSUR is made up of five member countries: Argentina, Brazil, Paraguay and Uruguay and Venezuela. Recently, notification of suspension of membership was handed down to Venezuela.

[46] Members of the Caribbean Community (CARICOM) include Antigua and Barbuda, The Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, and Trinidad and Tobago. Associate members are: Anguilla, Bermuda, the British Virgin Islands, the Cayman Islands, and the Turks and Caicos Islands.

11	Turner & Pentecost (2010)	CARICOM	SVAR to estimate demand and supply shocks correlation.
12	Cuestas & Dobson (2013)	12 Caribbean countries	Unit root, fractional integration and club convergence test to assess similarities of shocks and inflation convergence.
13	Zhao & Kim (2014)	Eastern Caribbean	2-variable SVAR to estimate degree of shock symmetry
14	McKnight & Sanche (2014)	7 Latin American Countries	Cointegration, VECM, Granger causality and rolling-window techniques to investigate shock symmetry (in a REER model) and long-run and short-run interactions and degree of heterogeneity in monetary policy transmission
15	Colley (2015)	CARICOM	OLS estimation of augmented gravity model of international trade; and Poisson pseudo maximum likelihood and least square dummy variable estimations to assess viability of the proposed Caribbean Monetary Union (CMU).
16	Kappel (2015)	NAFTA[47] and MERCOSUR	Correlation and SVAR model of output and price to investigate similarities in demand and supply shocks in the evaluation of the two blocs' monetary integration.
17	Braithwaite (2017)	CARICOM	Long run VAR approach to examine correlation of demand and supply to assess the feasibility of the proposed CMU

Sources: Author' compilation and various literature

Agreement (NAFTA) countries.[1] The summary of some relevant empirical literature on the feasibility of monetary cooperation of countries within these region and sub-region are highlighted in Table 2.3 above:

There are very scanty literature on the prospects of the monetary integration of Latin America[1] (including members of the Common Market of the Southern Cone (MERCOSUR), and the Andean Community) and the Caribbean (including the Caribbean Community (CARICOM) members and its associate members), including the North American Free Trade

Having reviewed several literature on monetary integration and OCA analyses of the regions of Africa and some regions of the world, the next section and subsections of this chapter review of the assessment of the monetary integration of the EMU, bringing out the OCA design flaws in the creation of the Eurozone as revealed by the Eurozone crisis.

[47] NAFTA countries are Canada, Mexico and United States.

2.5 EMU Design Flaws and Eurozone Crisis

The history of monetary integration in the Europe continent can be traced back to the emergence of the Austro-German Monetary Union which commenced in 1857 and lasted till 1861. Some of the other monetary unions among the European nations were the Latin Monetary Union which was in existence for sixty one years (1865-1926) and the Scandinavian Monetary Union that existed between 1873 and 1931. The German Monetary Union which came into creation in 1876 after many stages of transformation, leading to the creation of the *Reichmark* and the *Reichsbank* which were precursors of the former German currency, the *Deutsche mark* (DM) and the German central bank, the Bundesbank respectively. Genuine efforts towards monetary integration in Europe were made after the World War II which Sanchis i Marco (2014) quoting Triffin (1962) describes as the period of European 'liberalism triumphant'. The two major monetary agreements followed: (i) Intra-European Payments and Compensation (which existed for two years – 1948-1950) and (ii) the European Payment Union (which lasted for seven years - (1950-1956) and this was regarded as the 'first step towards convertibility' (Sanchis i Marco, 2014).

The enthusiasm to have a stronger European monetary union (of single currency) grew between late 1960s and early 1970s with various plans (The Barre Plans of 1969, The Schiller Plan, and The Werner Plan of 1970). The Exchange Rate Mechanism (ERM) of the European Monetary System (EMS) was preceded by the European Monetary Snake which lasted for six years between 1972 and 1978. However, the 1969 initial plan for a single European currency was stalled by the 1971 collapse of the Bretton Wood System and the 1972/73 oil crisis; thus culminating into postponement until the momentum was gathered around the late 1980s and early 1990s with the 1989 Jacque Delors Report on Economic and Monetary Union (EMU), igniting the course by drawing a 3-stage plans towards realising the formation of EMU. This ten-year period (1992-2002) three-stage plan was set towards adopting the single currency

(the euro) with the particular aim of fostering the EU economies as regards inflation rates, interest rates, exchanges rates, budget deficits and public debts as stipulated by the Maastricht Treaty of 1992. Eventually, by 1 January 2002, the euro single currency became operational as the single currency of twelve (of the fifteen) EU members.

Around the inception of the euro (the third stage of EMU development), academic literature offered a measure of convergence to be met by prospective members of the Eurozone. The expected characteristics of the EMU member states in determining the likely success or failure of the Eurozone (as offered by the OCA theory) are as summarised in Table 2.4 below which shows how the entire Eurozone fared in the achievement of some of the crucial convergence factors at the start of the Eurozone: [48]

Table 2.4: Summary of the Posture of the EMU in the Context of OCA Theory and Convergence Factors

	Convergence Criteria	**Narration of Achievement in Eurozone**
	Labour Mobility	A variety of measures pointed to the conclusion that labour mobility and the speed of labour market adjustment are lower in Europe when compared with the United States. Furthermore, in a 2007 economic survey of the EU, the OECD established that geographic labour mobility was low as only 4% of the EU workforce have worked lived outside their domestic environments, while language barrier was a crucial issue.[49]
	Degree of Commodities Market Integration	This relates to the similarity in production structures of the Eurozone member countries. There were evidence to support the inference that there is dissimilarities in production structures of the countries analysed.
	Openness and Size of the Economy	Many literature on EMU got the evidence to suggest that this is a criterion fulfilled as the degree of openness within the Eurozone were high across member countries. Willett et al (2010) in investigating the endogeneity of the OCA theory observed the rapid growth in the intra euro trade/GDP ratios of the Eurozone countries, moving from the mid-90s 25% to above 40% by 2000.[50] The evidence got by Trichet (2006) shows increase in total intra Eurozone trade in goods and services from 31.5% to 37.5% between 1998 and 2005.[51]

[48]With reference to Brian Burkitt as quoted by The New Europe Research Trust (2001).
[49] Eichengreen (1991) in an assessment of labour mobility and the incidence of shock in Europe, made the comparison of comparable measures between Europe on one hand and Canada and the United States of the other hand.
[50] Though, the test of the assumption of the OCA theory failed in this respect.
[51] This is from a paper presented by Jean-Claude Trichet, the President of ECB at the 15th European Regional Conference of the Board of Governors in Paris on 31st March 2006

	Degree of Commodity Diversification	Because most Eurozone countries are industrialised nations, it would be very easy for these countries to fulfil this condition of high level of commodity diversification.
	Fiscal Integration	Eichengreen et al (1990) and Feldstein (1992) established that as at the time of going into the EMU, the least satisfied condition was the fiscal federation criteria, a flaw described by De Grauwe (2014) as a 'major design failure'. Pasimeni (2013) making references to the 'Marjolin Report' of 1975 and the 'MacDougall Report' of 1977 highlights that the problem of a common fiscal capacity at the European level was well noticed. MacDougall (1992) concluded that for a foreseeable future, there may not be significant development of intra-Eurozone fiscal transfer subsequently after the start of the Eurozone.
	Degree of Political Integration	Krugman and Obstfeld (2003) among other literature on the establishment of the Eurozone concluded that as at the commencement of the Eurozone, monetary union was placed above political union.
	Similarities in Inflation	At the stage of entering the EMU, most Eurozone member state (courtesy of their ERM membership) took on economic policies that strategically caused them to achieve similarities in inflation rates, though this was at the cost of high employment rated across the whole of Europe (Baimbridge et al, 1998).
	Price and Wage Flexibility	Results from many studies on price and wage flexibility show that there were evidences to support the claims that as at the time of going into EMU, there were substantial wage-price rigidity across Europe.[52]

Source: The New Europe Trust (2001)

The inference drawn from these is that many Eurozone's member countries failed to meet the criteria of the OCA as specified by the theory and as expressed above.

2.5.1 Eurozone Crisis in the Light of OCA Design Flaws

Deficiencies and incompleteness of the construction of the Eurozone were exposed by the financial crisis which clearly revealed that the euro area is not an OCA. The Eurozone crisis is better understood from the view point of the EMU's unique institutional set up in which member countries of the Eurozone came together operating common monetary policy with 17 macroeconomic and fiscal policies. This implies a single currency area made up of many (17) sovereign member countries (one money, many economic and fiscal policies). These

[52] Blanchard and Katz (1992), Eichengreen, (1991), (1993), Calmfors and Driffil, (1998) and Goodhart (1995)

sovereign states were given freedom that is sufficiently enough to safeguard their individual diversity, establish their own business model, formulate their own fiscal policies and tailor their institutional and other economic and political policies in tune with their respective national preferences which are very likely to differ in many respects (like income distribution, roles played by the government in manipulating the economy). Member sovereign governments bear the consequences of these actions, creating members' vulnerabilities while the option of public debt mutualisation among the sovereigns were ruled out. In the first instance, the above factor combined together, caused the partial shift of fiscal recklessness from one sovereign to the others thus leading to fiscal deficit bias. For the monetary union as a whole, a country's lack of fiscal sustainability has consequences arising out of the harmful nature of excessive public debts. In the Eurozone, excessive public debt caused upward movements of the long term interest rate for all member. The second instance was that Eurozone members' public debts were issued in a currency they cannot create. A favourable implication of the creation of the Eurozone and the introduction of the euro is the abundance of capital coming out of the elimination of exchange rate risks. These beneficially stimulated real estate investment and consumption (public and private). However, over time, there were decline in competitiveness while there were sharp increase in unit labour costs within the Eurozone. For instance, during the pre-euro crisis period following the formation of the Eurozone, there were per annum increase of 3.0% in Spain's unit labour cost, while Germany recorded -0.1% decline over same period. The 2007 financial crisis opened up fiscal vulnerabilities apparent in sharp increases in affected member's interest rate and shift in investors' sentiment. These trigger the Eurozone crisis.

Nevertheless, the crisis in the Eurozone could be described as 'systematic' in nature, springing from the consequences of the flaws in the design, construction and implementation of the EMU project. The crisis can be described as self-inflicted crisis which could have been

avoided. Specifically, the crisis is a repercussion of the failure to put some essential components in place for the formation of a monetary union viz: (a) failure to establish a banking union that should accompany the monetary union; (b) failure to institute a lender of last resort (LOLR) for sovereign borrowings;[53] (c) inadequacy of surveillance and regulatory mechanism that should be expected to guide against potentially destabilising effects of credit flows within the monetary union and the build-up of members' states' current accounts imbalances; (d) too narrow focus on price stability (inflation moderation) on the overall at the monetary union's level and at the expense of other macroeconomic targets like economic growth, employment, financial stability etc. Going by these, a thorough consideration of trends of events in the Eurozone since its design and take-off reveal three main flaws in the design of the Eurozone as discussed in the following paragraphs.

Major Flaw 1 - Absence of Effective Economic Governance Mechanism: This is Eurozone's design failure to provide a mechanism for effective economic governance in which monetary policy adjustment could be imposed (at the monetary union level) on members that are out of line.[54] In the practical sense, economic and employment policies meant for individual member countries were not enforced but largely ignored, hence the lack of effective tools to correct macroeconomic imbalances. Because of the irrevocably fixed exchange regime in the Eurozone, and with the assumption of high level of flexibility within the economy, it is only prices and costs adjustments that could correct cross country differences in competitiveness. However, output and employment should be adjusted (as federal funding is lacking in assistance) in situations of slow downward rigidity of prices and costs when there is slow implementation of structural reforms that are meant to address the

[53] The LOLR as an institution should have been with the responsibility and authority having the resources to fund borrowers face with liquidity crisis in order to avoid liquidity problem turning to solvency crisis within the monetary system and safeguard against moral hazards.
[54] Even as the Maastricht Treaty revealed an Economic and Monetary Union (EMU), the 'economic' part was missing (Riet, 2013).

rigidities in supply. It was observed that macroeconomic divergences in the Eurozone was also aggravated when competitive member nations enjoyed better economic growth.[55]

Consequently, in the wake of the financial crisis, Eurozone countries that recorded recurring current account deficits, weak competitiveness, excessive private/public debts and other economic imbalances specifically experienced the financial market vulnerabilities. Public sector funding stood as replacements for the reversed private sector capital flows. Although, in the aspect of fiscal policies, the Treaty specified limits of public sector deficits (budget balance and gross debts), including sanctions against erring members, the correction of excessive budget deficit was however sluggish while the enforcement of appropriate sanction was avoided. There were apparent resistance in 2003, by German and France to correct their excessive budget deficits. This caused a dent on the Eurozone's fiscal governance as incentives meant to ensure sound public finances were further undermined when more flexibilities in response to country-specific mitigating conditions were introduced in 2005 by the Stability and Growth Pact (SGP).

In the Eurozone, the after-effects of these (as the global financial crisis set in) were high levels of public sector debt rising further due to subsequent bank rescues, fiscal stimulus and austerity measures including economic recession. There were increases in sovereign bond yield and concerns for solvency due to liquidity stress resulting from the spread of market volatility to vulnerable Eurozone countries.

Major Flaw 2 - Retaining Banking Supervision and Resolution at National Levels: This is about the retention of the Eurozone's banking supervision and banking resolution within Eurozone in the hands of sovereigns at national levels. This ignored the trade-offs in the financial trilemma. The Eurozone's financial integration (particularly in retail banking), due

[55] Delor's Report admitted the underestimation of the Eurozone as a single market with a single currency exacerbating divergences among members.

to its incomplete nature, allowed the accumulation of foreign short term liabilities and debt-based interbank liabilities, but concentrated their assets with real estate borrowers at home rather than diversifying the risks involved (Draghi, 2014). Banks' balance sheets were consequently made vulnerable to asymmetric shocks, external contagion effect due to the mismatch; and eventually, the sovereign governments bore the bail-out burden. Also, cross-border inter-country financial interaction further made the preservation of financial stability at natural levels worse. This caused the Eurozone's sovereign government to: (a) act in line with their individual own banking rules in banking supervision within their domains; (b) use their local judgments in applying the European banking laws; and (c) make their own self decisions in recapitalising banks that were over-burdened with debts and in determining if forbearance is needed in handling non-performing loans in banks' portfolios.

In a single market (like the Eurozone), when financial policies are formulated and implemented at national levels, close coordination of member states is necessary when handling international banks. Unfortunately, this failed to work well for the Eurozone during the crisis, when the need to maintain financial stability within the EMU caused the breaking-up (or restructuring at short notice) of cross-border banks. There were no enough fiscal space in many member countries to the rescue of ailing banks. In some countries having large number of unviable retail banks, private sector was over-indebted in addition to recording excessive liabilities, while the size of the banking sector in some over-banked countries enormously exceeded their GDP. The differing features of the Eurozone's financial system propelled a 'vicious feedback loop' between troubled banks that had their balance sheets reflecting large volumes of sovereign debts and the vulnerable sovereign governments that had fiscal spaces that were not enough for the rescue operations. The consequent increase in interest rates (lending and borrowing) resulted in huge creditworthiness fragmentation of Eurozone's financial market along national lines. The financial crisis also exposed the

absence of the tools for the management of cross-border flows of capital and for the prevention of regional credit boom, and the Eurozone's common central bank could not handle these. There was also a lack of macro-prudential policies at the national levels (or coordinated at the union-wide levels). The EMU design shifted this to a future time.

Major Flaw 3 - Lack of Financial Back-stops and Crisis Resolution Mechanisms at the Union Level: The third major faults rests of the failure of the EMU design to institute financial back-stops and crisis resolution mechanisms. At the Eurozone level, there was: (i) the lack of built-in financial backstops that could give supports to a sovereign government experiencing serious liquidity quagmire; (ii) the absence of a mechanism that would give room to insolvent national governments to organise the restructuring of their debts. The Eurozone's common central bank is forbidden from financing sovereigns as well as prohibiting measure that forced banks to preferentially finance national governments.[56] Even with good purpose, convergence (entry) criteria and rules, the Eurozone architecture failed to incorporate crisis resolution mechanism in situation when a member country encounters harsh problems and could not access international financial markets. What such design depicted was a Eurozone of fair weather that could not be sustained in stormy weather. Owing to the heavy cross-border finance received by some Eurozone members during the first decade of the union, the sudden stop of these capital inflow made these countries to be vulnerable during crisis. So, when the high interest rates and funding difficulties came calling, sovereign governments fell into self-fulfilling defaults.[57]

[56] At the EU level, its members (or the EU itself) are not permitted to assume public sector commitment of a member country; although, a facility for assistance in time of balance of payment crisis are available outside the EZ, but at the EU.

[57] Gros (2012) revealed the noticeable gap between the uncontrollable default in the EZ crisis era and the partial default (attributed to inflation) during the EMS crisis period when countries participating in EMS then had their monetary policy independence and respective currencies and could devalue their currency for the avoidance of the tension in the financial market.

The essential 'sudden backstop' of official funding for Eurozone countries facing the sudden stop in international funding was lacking. These are the reasons why De Grauwe (2012) concluded that euro was characterised by a 'systematic fragility' because member countries of the Eurozone exposed to erratic capital inflow were opened to vulnerabilities and contagion. These countries lack the crisis-time support of a federal state and the option to seek for bail-out from other members of the union. Whenever these countries face huge shock, they rely on market expectations because they lack a central bank that could print the fiat currency needed for the redemption of their debts. It is therefore necessary to put in place, a process of getting rid of unsustainable debt and prevent contagion within Eurozone.[58]

Discussions in Literature: Many authors and researchers on the OCA theory evidently concluded that the Eurozone is not an OCA. They gave warnings about the dangers of a single monetary policy for the zone because of the zone's inability to fulfil the OCA theoretical preconditions for an optimal currency area.[59]Initially, from the second half of the 1980s, a large body of monetary integration researches could reveal: (a) how the EMU was to be designed; (b) the conditions that were necessary for the success of the 'proposed' monetary union; and (c) the impending dangers of not establishing a true and genuine monetary union in Europe.[60]De Grauwe (1992) developed the first monetary integration model while Fratiani and von Hagen (1992) and Gros and Thygessen (1992) gave some insights on the benefits and costs of monetary unifications. As Eichengreen and von Hagen

[58] As observed by Riet (2013), though the euro successfully maintained price stability, at the EMU level, 'complacent national policy making, accumulated national supervision of financial industry and the absence of macro-prudential tools to counter a credit-driven boom in overheating economies' of the EZ all came together to undermine the achieved price stability.

[59] Some these research works are carried out by Krugman (1993), Decressin and Fatas (1995), McKinnon (2001), Wyplosz (2006), among others.

[60]Some of these research works were contained in '*The European Monetary System'* edited by Giavazzi, Micoss and Miller (1998); '*A European Central Bank?*' edited by de Cecco and Giovaninni (1998) and various editions of '*Monitoring European Integration'* and annual reports produced by the Centre for Economic Policy Research (CEPR) from 1990-2003 as referenced by de la Dehesa (2012).

(1995) raised fiscal policy and fiscal federalism issues in a monetary union, de la Dahesa and Krugman (1993) and Krugman and Venables (1993) revealed the 'regional and agglomeration effects of a monetary union'.

There were research evidence from Schwarts, (2013) to conclude that there was failure in realizing the great hopes surrounding the euro (at its inception) as a currency intended to be as strong as the deutschemark; and also that the hopes for the euro to serve as European's unity symbol were dazed by the financial crisis which has created discords among the EU members, thus indicating defected design of the euro. Originally, the euro was intended to be fashioned as 'a kind of gold standard for a system of fiduciary money, but with the escape clauses to make it less automatic, given the impossibility of devaluation (as under the gold standard) as the main building condition for the Eurozone member countries (Schwarts, 2013). One further design issue raised Schwarts (2013) was that the euro was based on the idea of high degree of neutrality of money in Europe, thus giving room for the euro to be able to adapt to changing circumstances through relative price movements and not by means of monetary management. As the head of the Eurosystem, the ECB was conferred with the single mandate of maintaining price stability by the 2008 Treaty on the functioning of the EU. These caused the conclusion that the present parlous situation of euro indicated that at its conception, the currency suffered from fundamental defects and that these design flaws were capitalised upon by the Eurozone members to finance unsustainable fiscal policy (Schwarts, 2013).

Gathering conclusions from economic research papers and books before and after the commencement of the euro, de la Dehesa (2012) highlights main dangers that could be faced by Eurozone as: (i) because capital and labour do not move freely among Eurozone member countries; and because prices and wages are not flexible within the Eurozone as they manifest in Canada and the United States, Eurozone is by implications, not an OCA. There were

general awareness in 1999 that Eurozone members did not fulfil the conditions for a monetary union; (ii) consequent from (i) above, if Eurozone is not an OCA, a 'one-size-fits-all monetary policy can be too tight for the matured Eurozone members witnessing slow growing internal demand couple with lower inflation rate, and such policy can be too loose for the 'catching-up' and fast growing Eurozone members that are characterised by higher-than-average inflation rate; (iii) given the Eurozone's evident production specialisation, some member countries can suffer asymmetric shock that does not affect other member because of the build-up of growing internal and external imbalances and exogenous shocks; (iv) there may be a mix of negative and positive asymmetric shocks in Eurozone's member countries as a result of the 'agglomeration' of different productive sectors in some special areas within the euro area. This would be as a result of internal and external economies of scale produced by the combination of a common and free internal market and the single currency, the euro. De Grauwe (2012) got evidence to show that members of the Eurozone experienced asymmetric shocks reflecting clear divide among the northern and southern Eurozone countries; (v) there is the possibility for Eurozone member nations to have incentive to adopt huge fiscal deficits/public debts and therefore 'free ride on other members' of the monetary zone which eventually finance them, provided exchange rates risks are not incurred;[61](vi) in the Eurozone, there would be asymmetric shocks that could be avoided (or its effects reduced) if a single or common fiscal policy is in place either through a large common treasury or a common budget of a large European fund with the purpose of helping affected members. This is one of the essentials for a single currency. The point raised here was that the whole of Europe lacks fiscal integration; (vii) if a monetary union as depicted by the Eurozone was to flourish, this could not be made possible without a high-flying fiscal union.

[61]This opens the flaws of a single fiscal authority in Eurozone as necessitated by the need fiscal discipline on all Eurozone members.

Eventually, such fiscal union is expected to lead to a political union manifested by a common parliament and executive powers or a confederation of states.

Gibson, Palives and Tavlas (2013), while presenting an analytical overview of the euro area crisis, gave the following three reasons for the optimism of European political leaders and economists on the success of a monetary union (like the euro area) even despite the presence of asymmetry shocks and the absence adequate adjustment mechanism, thus: (a) if at the national levels, sound fiscal policies are maintained, the incidence (and the resultant effects) of fiscal-induced asymmetric would be minimised (Krugman, 2012); (b) towards reducing impacts of symmetric shocks, national policy makers would apply structural reforms (given the reduced ability to use the demand side policies to counter asymmetric shocks) which may include the freeing of labour and products markets; (c) it would be easier to evaluate the nature of risks and consequently appraise investment opportunities within the euro area due to the belief that the euro would eliminate exchange rate risks from national interest rates.[62]

Coming from the novel explanations of the Eurozone crisis in relation with the augmented logic of the Mundell-Fleming Policy Trilema', Dymski (2013) raised some points on factors neglected by the design of the monetary zone stating that in relation to the Mundell-Fleming trilema, the Eurozone neglected the Fleming's Keynesian modelling but took after Mundell's approach, thus implying the emphasis of the Eurozone on pre-determined rules guiding the behaviour of government and a 'wide flow of market forces, disciplined by financial flows'. He identified the second flaw in this respect as the failure of the Eurozone to pay attention to the growing powers of the globalised finance. Stemming from these are bank regulation/bank behaviour trilema which reveals the consequences of the economic architecture of the Eurozone precluding 'adequate bank and financial market supervision' and prohibiting the

[62]Fernadez-Villaverde, Garciano and Santos (2013).

'lender-of-last-resort intervention' despite simultaneously enabling 'hyper-competition among financial intermediaries'. These are some of the principal factors that led the Eurozone's financial system into crisis as the configuration of the Eurozone is such that could not calm the financial sectors of the euro area down and while burdened by problematic banking sectors, financial stability could not be ensured (Dymski, 2013). Though there were global financial deregulation and revolution in macroeconomic theory and policy making as at the time of designing the Eurozone, Feldstein (1997) observed that out of the Mudell's four criteria for an OCA, the Eurozone met just one (which is labour mobility) and failed the other three tests.[63]

De Grauwe (2013) restated his 1999 comparison of the Eurozone as 'a beautiful villa in which Europeans were ready to enter. Yet, it was a villa that did not have a roof. A long as the weather was fine, we would like to have settled in the villa. We would regret it when the weather turned ugly'; adding that the Eurozone's design failure have 'become even more manifest as the ones that were perceived before the start'. It was further highlighted that 'the Eurozone look like a wonderful construction at the time it was built, yet it appeared to be loaded with design failures' De Grauwe (2013) traced the origin of the design failure to two factors: (i) booms and bust dynamics; and (ii) lack of stabilisers (De Grauwe, 2013). The first argument was that the endogenous dynamics of booms and busts continued to work at the national levels and these were not incorporated into the union-wide dynamics. While money and monetary policies in the Eurozone were fully centralised, other macroeconomic policies were left firmly in the hands of the national governments, thus causing 'idiosyncratic movements' which the existence of euro could not constrain. Consequently, the Eurozone has very little to make the booms and the busts converge at the Eurozone's level. These booms

[63] These three areas of failures manifested in: (i) inflexible domestic prices and wages; (ii) minimal fiscal transfers across Eurozone member countries' borders; and (iii) heterogeneity in shocks , in which shocks do not have similar effects.

and busts have the origins of their own lives at the national levels and could not become a 'common boom-and-bust dynamics at the monetary union's level. The worse scenario highlighted by De Grawe (2013) was how Eurozone level booms and busts can be affected at the national levels given the fact that the union's single interest imposed on all Eurozone's members by the ECB is 'too low for the booming countries and too high for the countries in recession'. In the booming countries, the union-wide single interest rate translates to low real interest rate, in effect magnifying the boom. On the other hand, the single interest rate yield high real interest rates in countries with recession/low growth, thereby causing further economic devastation. The fact is that single interest rate exacerbates the feasible difference between 'the booming' and 'the busting', making the booming countries to be further boomed while the busting countries moves further into recession than when a monetary union is not in existence. The second argument of De Grauwe was that the stabiliser that existed at the national levels before the beginning of the monetary union was stripped away from the Eurozone members 'without being transposed at the monetary union level'. The lender-of-last-resort function of central banks is the fundamental stabilising force existing at the national levels at the start of the Eurozone. What came suddenly, by the implication is that Eurozone's member countries had to issue debt in euro on which they no longer have control. National governments, thereafter, were unable to guarantee the availability of cash to roll its debts over.[64]This made the Eurozone member states to be 'naked' and 'fragile' and unable to deal with coming national disturbance (De Grauwe, 2013). What the architects of the Eurozone could not understand in the design was that the lack of guarantee could trigger self-fulfilling liquidity crises caused by a 'sudden stop' which could plunge member countries further into solvency problem.[65] Apart from liquidity problems turning into solvency crisis,

[64] This was possible before the start of the Eurozone when member states were issuing debts in their national home currencies and were able to guarantee the availability of cash to repay debt at maturities.
[65]Ireland, Spain and Portugal experienced this.

affected Eurozone members were forced to switch off the automatic stabiliser in the budget, scramble for cash, go into austerity, hence cutting expenditure and raising taxes and revenue.[66]

A view brought to the fore by Colombatto (2000) was that 'in sharp contrast with historical precedents, the euro was not perceived a symbol of a common European identity, either at the beginning of the 1990s or back in the 1960s when the project for a Europe common currency was first conceived'. This was based on the premise in the contributions of Cohen (1993) and Bordo and Jonung (1999) as these literature are able to show that political unification preceded all past monetary unions that later adopted common currency; but contrary in the case of the Eurozone, the justification for monetary union was provided just by the idea of political union. The contrast picture of the support for the Eurozone in the 1990s as painted by Feldstein, (as cited by Colombatto, 2000) emanated from the 'desire to replace discredited national policy makers with foreign, allegedly independent technocrats or from the Franco-German desire to establish political hegemony'. In this same light, further conclusion was that the euro lacks the legitimacy.[67] It was claimed that the euro has scanty legitimacy because the European political ideal itself lack legitimacy. The proposal for the euro (and Eurozone) was seen to tend to be 'assimilated to a matter of monetary coordination, a concept with long tradition and little effectiveness in the European debate'. From the viewpoints of European public, the common currency was regarded as something vague, which is temporarily remote, thus causing the gradual neglect of the implication of the euro for centralized policy making.[68] Colombatto pointed out that many literature affirmed the idea of the EMU became political when the 'questionable legitimacy' of the euro became obvious

[66] De Grauwe (2013)
[67] De Jasay (1995) considered an institutional arrangement to be legitimate if it is accepted in the absence of incentives or sanctions.
[68] (Colombatto, 2000)

just as some European countries (like the UK, Scandinavia) perceived the euro as a political phenomenon from the beginning. Colombatto (2000) further claimed that the principle of harmonisation and the introduction of the euro were not independent in the context of the EU where the single currency ceased to be mere monetary technicality, but only became political matter for the sake of harmonisation. In this context, the principle of harmonisation relates to the manifestation of two properties of the OCA: (i) harmonisation – bringing about homogeneities in production structures and in institutional conditions which make asymmetric shocks less disruptive; (ii) harmonisation – where substantial transfer from one group of member nation to another would compensate and smooth out potential divergences with the currency area. Obradovic (1996) explained that most European countries are characterised by different traditions and history, value systems, institutions and myths and that across countries in Europe, huge variance between the 'actual condition' and the 'rule of law ideal' caused the proliferation of different systems of informal rules and consequently, different culture (particularly, in the Western Europe); adding that the elimination of these differences would take time and highly possible to be catastrophic. Attempts to force institutional homogeneity in the Eurozone through the introduction of new and common system of codified rules that ignore local traditions and cultures in Europe would result in tension and crisis within Eurozone.[69] One further source of ambiguity in the establishment of the Eurozone and the introduction of the euro is the heterogenous perception (within Europe) of the political consequences of the EMU. A group of countries (within the EU) aimed at achieving 'continental supremacy and world status through political integration.[70]The other group of countries (within the EU) gave support to the EMU project with the view of EMU as

[69] (Colombatto, 2000)

[70] Once the euro area integrated into a new federal organisation, these countries hope to emerge as much stronger contenders in the international community. Their leaders would have enhanced their own prestige and authority in the domains of ordinary policy making and law bargaining as well as their importance in historical perspective, being the founding fathers of a new political entity with a crucial role in the world (Colombatto, 2000)

'a means of promoting their allegedly incompetent (national) political elites (citing Italy); and also projected the view that monetary integration is protective devise to avoid catastrophic (or less desirable) scenarios'.[71]

2.5.2 The Incompleteness of the EMU and the Revelations of the Financial Crisis.

There were further discussion on the deficiencies and incompleteness of the construction of the Eurozone as exposed by the financial crisis in clearly revealing that the euro area is not an OCA.

Some of the defects and flaws in the design of the EMU were made manifest during the 2008/2009 financial crisis. The OCA theory (Mundell, 1961) provides that a complete monetary union is optimal if there are similarities in economic structures of member state which would cause similar (symmetric) reactions to shocks. The Eurozone crisis was the form of asymmetric shock highlighted by the OCA theory. According to Eichengreen (2009), when there were downward movements in housing prices, these falls were more dramatic in some member countries than others and the resultant increase in the rate of unemployment were not similar in the Eurozone countries. Due to the 'widening spreads and the associated credit default swaps', public finances of many Eurozone member countries were strained.[72] Eichengreen further explained that governments in the Eurozone recorded dramatic increases in public debts as a result of the need to act in avoidance of domestic banking collapse and ensure the sustenance of their various national economies, and that presumably, given these situations, many Eurozone countries would have preferred different policy responses to the

[71] Greece, Ireland, Spain and Portugal would have certainly considered the cost of staying out of the Eurozone as greater that the cost of staying within.
[72] 'Spreads' means the differences between 10-year government bond rate of Germany and those of each European country.

crisis situations. Eichengreen concluded that this depicts that the 'one-size-fits-all monetary policy' should have been out of the Eurosystem's design.

Although, one of focuses of the OCA theory is on the mechanisms for adjustment after exogenous shock, the design of the EMU produced some operating endogenous factors that reinforce asymmetry in business cycles and enhance instability. A single monetary policy of a single interest rate across the entire Eurozone implies too low interest rates in countries where inflation and growth are relatively higher, thereby causing domestic demand to grow further. On the other hand, Eurozone members with sluggish growth would experience the real interest as too high (De Grauwe, 2012). Ederer and Weingartner (2013) pointed out that the real interest rates effect outweighed the competitiveness effect working in the opposite direct, and that which generated sizable current account surpluses and deficits

On financial integration being very vital for the smooth functioning of a monetary union where mortgage markets, bond markets, equity markets and banking markets should be essentially integrated in providing different channels of risk-sharing within such monetary union and serving as an insurance mechanism that facilitates adjustment to symmetric shocks, De Grauwe (2014) explained that unfortunately, the design of the EMU underestimated the consequences of financial market integration which would have made it possible for the residents of the Eurozone hit by a negative shock (in 'bust' countries within the monetary union) to comparatively keep the level of their income higher than the level of output; while residents of countries experiencing positive shock (in 'boom' countries within the monetary union), as counterpart in risk-sharing comparatively keep the level of their income lower than their output.[73]

[73] De Grauwe (2014) quoted Asdrubali et al (1996) as having evidence to conclude that financial markets in the US allows for considerable risk-sharing among US regions and that this risk-sharing through financial market (integration) is about twice as important as the risk-sharing provided by the US government budget.

Further to the above, identified areas of EMU design flaws exposed by the financial crisis are: (a) absence of integrated financial framework (that would have ensured Eurozone's stability, minimised costs of bank failure to citizens of Europe, provided common mechanisms to resolve failing banks and provided guarantees to customers' deposits; (b) absence of integrated budgetary framework (that would have ensured sound fiscal policy-making at the national and Europe (union-wide) levels, provided different forms of fiscal solidarity and provided 'coordination, joint decision-making, greater enforcement and commensurate steps toward common debt issuance';(c) absence of economic policy framework with sufficient mechanisms (that would have promoted sustainable growth, competitiveness and employment through national and union level policies that would cause smooth functioning of EMU; (d) absence of the necessary democratic legitimacy of decision making with EMU, based on the joint exercise of sovereignty for common policies and solidarity.[74]

Drawing from various discussions on the future of the Eurozone during and after the financial crisis, and based on the premise that the 'existing EMU' was deficient and incomplete, the European Commission acknowledged those architectural flaws that were predicted at the outset of the Eurozone project as:

i. lack of mechanism that would have forestall "the accumulation (in some Eurozone member countries) of large private and public debts, losses in competitiveness and macroeconomic imbalances that caused financial vulnerability of member countries when the financial crisis struck";

[74] These were assertions made by Herman Va Rompuy, the President of European Council in a report for discussion in June 2012.

ii. lack of "EMU's unique status that would have combined centralised monetary policy with decentralised responsibility for most economic policies and with no centralised fiscal policy function or fiscal capacity (that is, federal budget);

iii. lack of mechanism to contain/curtail global liquidity excess and the consequential mispricing of risks of both private and public sectors within the Eurozone;

iv. lack of the responsibility for prudential supervision and crisis management at the Eurozone levels, even as the pace of financial integration accelerated sharply at its inception, creating opportunities and accelerating shocks transmission across national borders;

v. lack of an integrated EU level framework and a mechanism to mutualise the banking sector risks. This caused powerful and damaging loops ('vicious circle') between the banking system and sovereign states within EMU and further compounded the debt crisis. This lack of crisis management frameworks resulted in the absence of 'an effective mechanism to provide liquidity to the distressed Eurozone member states and thus the failure to manage contagion risks and safeguard financial stability in Eurozone;

vi. the coordination of national economic policies based on peer pressures and recommendations (tagged 'soft instruments') which has limited impact on industrial Eurozone member countries; causing failure in closing the growing gaps in growth and competitiveness between member countries. Further, the euro area wide effects of national measures were not given good degree of consideration.[75]

Praet (2013) was of the view that, "the euro area lacked certain institutional elements which are associated with federations and which acts as crisis prevention mechanism ex ante as well

[75] From the November 2012 Report of the European Commission titled: 'Genuine Economic and Monetary Union'

as shock absorber ex post".[76] Firstly, on crisis prevention, excessive risks built up due to too complacent policy regulations in the financial sectors within EMU. Risk accumulation occurred when the existence of the monetary union made it easier for the deficit countries to apply cross border capital inflows in the finance of their macroeconomic imbalances for time period longer than necessary. With the post-2008 economic deterioration brought about by the financial crisis, when the capital inflows turned into outflows, these imbalances resulted into problems for the affected countries as well as the contagion effect union-wide, thereby causing 'a twin crisis' as private sector debts were rapidly turned into public debts, leading to onward transmission into 'negative feedback loop between sovereigns and banks (Preat, 2013). The following similar positions were raised by Ederar and Weingartner (2013): firstly, in the wake of asymmetric shock experienced within the Eurozone, the strong increase in cross-border capital flows and of financial assets within the zone worked toward destabilising the monetary union. They added that these could have been forestalled by a common banking supervision mechanism as well as a common monetary authority applying strong tools for bank resolution. The revelation brought to the fore by the financial crisis is that financial stability is a common good necessitating preservation by shared responsibility. Secondly, the prolonged differences in macroeconomic (current account) imbalances and competitiveness were regarded as irrelevant. The postulation adopted is that, saved from surveillance of fiscal issues, it is not necessary to monitor macroeconomic imbalances closely. The financial crisis reflected how strong the effect of negative externalities of a monetary union member country on the entire union. Thirdly, fiscal policy coordination and surveillance framework existing at the beginning of start of the Eurozone was to not strong enough prompting its implementation by the member countries to be 'insufficiently strict'; and consequently, budgetary policies

[76]The claim was made in a speech delivered by Peter Praet, a member of the Executive Board of the European Central Bank on 17 April 2013 in Beijing.

with the Euro area were not sufficiently constrained. There were no emphases on the need to preserve fiscal space, ensure fiscal discipline and therefore allow automatic stabiliser to come to play in times of financial turmoil.

Broadly on the other hand, Praet (2013) highlighted that the lack of effective crisis management mechanism at the strike of the Euro crisis was manifested in the instance of the assumption of the presence of huge automatic stabilisation at national levels as depicted by the design of the EMU. What the financial crisis was able to reveal here was insufficient shock absorbers at national levels. The scale of the post-2008 financial-crisis-shock was unprecedented in many euro area countries as they glaringly exceeded shock absorption capacity at national levels. One great design pitfall revealed by the financial crisis is the reliance on the national levels of the union for the fulfilment of the stabilisation functions since at the union-wide level, there were no mechanism that could give financial supports to the monetary union's member countries that experienced problems as well as lack of provision of efficient risk sharing mechanism that could have prevented contagion across borders. These became pronounced as there were no union-level institutions with the responsibility of ensuring that severe domestic banking systems problems would not impact fiscal sustainability within Eurozone. The second instance of revelation by the financial crisis was the lack of effective mechanisms or tools to mitigate contagion, because financial contagion was not seen as an intended consequence of financial integration. There were no 'circuit-breaking' crisis management tools or instruments that could limit feedback loops.[77]

Discussions up to this point stressed that from what the euro crisis could reveal, though the architects of the euro took the OCA theory with all seriousness, they had the belief that

[77]Explanations here were largely borrowed from Peter Praet's speech of 17 April 2013.

asymmetric shocks would not pose a major problem. The sudden cessation of the massive private capital movements from core countries of EU to the periphery countries left the economies of the periphery countries with high inflation rates and labour costs that were not in line with those in the core countries. This caused the euro area to face major problem of adjustment which the OCA theory had forewarned to be too hard to handle through the restoration of competitiveness through wage cuts.

De Grauwe pointed out that further exposures made by the financial crisis were the two overlooked 'fault lines' that marred the foundation of the Eurozone: (i) absence of mechanism that would have ensured the convergence of the competitive positions of member countries, and would have gone ahead to avert major trade imbalances within the monetary union;[78] (ii) absence of mechanism to resolve the chaos caused by the members' competitive positions and trade imbalances. These 'fault lines' were brought to the bare because the Eurozone was not, at the on-set embedded with a political union that was sufficiently strong enough. A political union is characterised with a centralised budget that would have, in times of crisis, provided these lacking automatic stabilising mechanisms. One further point raised by De Grauwe (2010) was that in designing the Eurozone, there was a complete rejection of 'any form of automatic insurance mechanism' simply because any insurance mechanism incorporated would be accompanied by moral hazard risk, a risk that would have encouraged national governments to take advantage of such insurance mechanism by creating excessive budget deficits and public debts; and that consequently, 'the absence of any insurance mechanism in the design of the Eurozone was caused by the need to avoid moral hazard. However, the financial crisis clearly forced national governments to provide such insurance, particularly when the banking crisis surfaced. Unfortunately, when Eurozone

[78] This emanates from way member countries firmly hold on to the formulation of economic policies (fiscal policies, social policies and wage policies etc), but failed to coordinate these policies (De Grauwe, 2010).

countries were (due to the forces of the financial crisis) essentially expected to provide solidarity, no mechanism was in place for smooth running of such supports (De Grauwe, 2010).

One surprise thing is that it was not foreseen that there were possibilities of countries facing adverse asymmetric shocks to simultaneously face fiscal burdens that would query the solvency of national governments. The Eurozone's adjustment problems swiftly transformed into many degrees of fiscal emergencies at both at the nation and union-wide levels. The euro crisis also revealed the little attention paid by the OCA theory to banking issues by giving little thoughts to how crucial bank guarantees at the union level are. In the US, bank deposits are guaranteed at the Federal level, thus removing the task of bank bailout from saddle of governments at the state levels; but in Europe, national governments abruptly assumed bank debts in bailout and this led to sudden increase in public debts (showing up in increase public debt/GDP ratios, at the national levels).

Tables 2.5 and 2.6 below offer summaries and explanations on problems and flaws revealed by the financial crisis, of the design of Eurozone.

Table 2.5: Pre-Crisis Problems and Flaws Manifested by the Eurozone Financial Crisis

Problem/Flaw	*Explanations and Narration*
Failure of the Stability and Growth Pact (SGP)	*SPG is the monetary union's cornerstone of fiscal prudence. *As at six year after the introduction of the euro (but before the euro crisis), between 2001 and 2006, one-third of Eurozone's member countries violated the two fiscal criteria of the SGP – (i) 3% budget deficit ratio and (ii) 60% public debt ratio. *This violation, leading to high public debt, reduced trusts in the effectiveness of rule-based surveillance.
Disregard of private sector vulnerabilities	*The sole emphasis on fiscal issues during the pre-crisis era led to the neglect of the need to be conscious of the behaviour of private sectors and the watch for vulnerabilities. *Consequently, there were unsustainable credit and housing booms in some countries (Ireland, Spain) as well as structural imbalances (high current account deficits).
Absence of effective tools to foster structural adjustments	*There was lack of proper mechanism to propel microeconomic and macroeconomic structural adjustments within the monetary union. *Greece, Italy, Spain, Portugal demonstrated this lack. *Appropriate microeconomic adjustments should have been in the area of regulations and policies affecting businesses, market flexibility, banking etc. *Examples of appropriate macroeconomic adjustments tools are price and wages, external balances, aggregate changes in productivity.
Absence of mechanism for crisis resolution	Sovereign debt crises within the Eurozone evolved as a surprise, causing policy makers of the currency area to improvise. *Though, there was post-crisis creation of financing mechanism (like the European Financial Stability Facility (EFSF) and the European Financial Stability Mechanism (EFSM) which both provided €500 billion). Such medium-term crisis resolution financing would have preferably been in a design in which the monetary union member state would not need to lend money to each other. *Banking union and centralised fiscal capacity would have been better appropriate.

Source: Author's compilation

Table 2. 6: Post-Crisis Problems and Flaws Manifested by the Eurozone Financial Crisis

Problem/Flaw	*Explanations and Narration*
Interdependence of banks and sovereigns	*It is evident that there was 'poisonous correlation' between banking and sovereign debt crises due to the national bank resolution regimes and the home country bias in bank's government bond holdings. Whenever a Eurozone member banking system falls into problem, the government of such country follow suit (as in the case of Ireland) and verse versa (as in the case of Greece). *Most Eurozone countries showed large size of their bank's portfolio of domestic government bond larger than what obtained in the US (Meller and Pisani-Ferry. 2012) *A banking union would solve the problem.
Interdependence of countries	*There was stronger interdependence of countries than what was generally perceived before the crisis. *Defaults by governments and private sectors in a small member country can lead to 'contagion' as a larger country's default could result in 'melt down'. A bankrupt Italy, for instance, would lead to a bankrupt Germany banking which would meltdown other banking systems within the union, with an accompanying disruptive effect outside the monetary union.
Absence of lender of last resort	*This indicates that governments of the monetary union's member states borrow as if they borrow in foreign currencies when there is, in principle, a prohibition of monetary financing within the monetary union. *When the level of debt is low, such lack of a lender of last resort may not be a problem.
Lack of union-wide integrated fiscal policy	*There is no institution responsible for the management of the monetary union's fiscal stance. *Member countries implement fiscal policies that are deemed appropriate for their individual economies. *The aggregate of these decentralised fiscal policies would not result in a fiscal policy that is optimal for the monetary union as a whole. Darvas (2012) got evidence to show that the aggregate fiscal position of the Eurozone was much better than that of the US in a study that covers a period between 1990 and 2017 projections, and that while the economic outlook was much more fragile in the euro area, there was the incidence of much stronger consolidation bias in the euro area as a whole than in the US.
Downward spiral and negative feedback between the crisis and growth	*In the Southern Europe adjusting countries where fiscal accounts are hard-pressed, there is 'downward spiral'. *Fiscal adjustments in each of these countries lead to weaker economy which reduces public revenues and create further fiscal adjustment needs. *The negative feedback loop between the crisis and growth in the economically strong Eurozone countries is pronounced. * An economic automatic stabilisation tool is needed as solution in this respect – just like the employment insurance in the US.
Executive and democratic deficit	*The crisis reveals governance problems (apart from sovereign debt, growth and banking issues). *European policymakers' responses were inadequate, partial and belated, consequently undermining credibility to resolve crises. *There was lack of decisive decision making processes that would have prevented the problem that surfaced. *Agreements on comprehensive solutions to issues and problems are technically and politically out of reach.

Source: Author's compilation

From the perspectives of Eurozone's financial systems, Table 2.7 below highlights the major crisis-revealed problems of the zone, the effects of these problem and would have served as preventive measures.

Table 2.7: Crisis-Revealed Problems of Eurozone's Financial System

Problems	***Effects***	***What would have prevented the occurrence of the problems***
Cross-border financial intermediation (caused hugely by debt-based wholesale banking market integration	*Vulnerability of member countries to shocks increased. *Caused sudden-stop problem.	Comprehensive equity market integration. (This would have absorbed shocks confronted by the monetary union.
High level of risk exposure (relative to loss absorbing capital) and debt within the banking system in the currency area.	*Demand for bail-outs as well as many needs for public financial assistance increased.	*Prudential guidelines. *Lender of last resort.
The contrast between the 'pre-crisis high degree of wholesale banking market integration and the absence of a system for the stability of the financial system.	*The resolution of problems faced by the banks was delayed. *The economy of the entire monetary union was slowed down	Banking union with three pillars: (i) a single supervisory mechanism; (ii) a single resolution mechanism; (iii) a common system of deposit insurance.

Source: Author's compilation

Before the 2007/2008 global financial crisis manifested, the structure of Euro area governance was believed not to be insufficient. The financial crisis could apparently reveal the three principal parties involved in the crisis as banks, national governments and the common central bank. The awkward structure of governance (reflecting the relationships among the common central bank (ECB), banks and national governments) was the root cause of the vulnerability of Eurozone to sovereign debt crisis. A key error of omission in the Maastricht Treaty was the failure to consider banking issues. This was further to the failure to establish coherent relationships among banks, governments and the common central bank (the ECB). These are relationships that would have been robust enough to face such financial crisis. Table 2.8 below apparently shows the central elements of what was lacking in the bank-government-common central bank relationships in Eurozone before the crisis.

Table 2.8: Governance Relationship Flaws exposed by the Eurozone crisis

	Relationship Flaws	Features
1	Government to government	In the Maastricht Treaty: *There was a provision with 'no bail out' clause. *This clause indicates that member governments in the Eurozone could not be requested to bail out a member government that is in trouble.
2	Common central bank (ECB) to government	In the Maastricht Treaty: *There was a provision with 'no monetary finance' clause. *This clause stated that the common central bank, (ECB) would not make credit available to member government; *This implies no 'lender of last resort' by the common central bank in favour of the member government.

Source: Author and Carlin and Soskice (2015).

Table 2.9: Pre-crisis Governance in the US and the Eurozone

Governance factors	***The USA***	***The Eurozone***
(i)Common shock; (ii) Financial stability; and (iii) Lender of last resort	(i) Federal Reserve stabilises common shocks. (ii) Federal Reserve has the responsibility for financial stability (iii)The Federal Reserve serves as the lender of last resort to the Federal government and to the banking system,	(i) ECB stabilised common shocks (in reaction to the crisis). (ii) The ECB was not responsible for financial stability. (iii) The ECB was not the lender of last resort to member (national) governments. (iv) ECB served as the lender of last resort to the banking system, though this was not entrenched (explicitly) in the Maastricht Treaty.
Budgetary provision for stabilisation in times of asymmetric shocks	*The federal budget provides stabilisation to the states whenever they encounter asymmetric shocks (for instance, through contributions to unemployment benefits and federal taxes).	*There was no central (federal) government. *There was no stabilisation through European budget; because there was no European budget.
Budget rules	*The states have balanced budget rules.	*Member nations had no national fiscal autonomy which is subject to rule.
Bank failure and government responsibility	*States are not responsible for the failure of banks headquartered in their respective states. This is the responsibility of the federal regulators and the federal government	*Member countries are responsible for the failure of banks headquartered in their respective countries. This is nether the responsibility of the Eurozone, federal regulators or a non-existing Eurozone government.
Bail-out	*The federal government does not bail-out delinquent states which are however allowed to default.	*A 'no bail-out' clause was explicitly entrenched in the Maastricht Treaty which provides that member government would not be bailed out in times of crisis.

Source: Author and Carlin and Soskice (2015).

In order to drive home the understanding of Eurozone's governance problems, it is useful to distinguish between the pre-crisis governance structures in a one-state monetary union (the US as a good illustration) and a multi-nation monetary union (like the Eurozone). Table 2.9 above shows these comparisons.

2.6 Conclusions

Theoretical and empirical literature on monetary integration and OCA and design flaws of Eurozone in the light of the OCA theory were reviewed in this chapter to make theoretical expositions of the underlying notion and concepts of this study to reveal various criteria, methods, tools and techniques employed in literature in the evaluation of monetary integration around the world. Further efforts were made to discuss the findings and conclusions of various authors and researchers on the architectural flaws of the Eurozone both from the financial crisis and OCA theoretical perspectives. What is apparent in the various empirical analyses is that established empirical literature known to this author, and those reviewed in this chapter did not employed some criteria and analytical tools in their analyses. Particularly, for the African monetary integration evaluation, they failed to connect some of these identified relevant and essential criteria to the investigation of the monetary integration. Some of these unexplored criteria identified by this author are the monetary perspective of money neutrality, similarity in the pattern on monetary reactions, monetary-fiscal policies interactions to determine the significant monetary dominance, degree of loss of monetary independence, suitability of a common monetary policy, and exchange rate perspectives of the uniformity of exchange rate determination by fundamentals and homogeneity of patterns of exchange market behaviours and exchange rate volatilities. These are gaps in knowledge exposed by this chapter, identified by this author and filled as appropriate by this research study. These are in addition to further in-depth analysis of some known OCA criteria performed in this research study. From the review of various discussions on Euro crisis, there were three major identified design flaws from which lessons for proposed monetary integration initiatives of regions of the world were drawn.

Chapter 3

Macroeconomic and Financial Stylised Facts in the WAMZ

3.1 Introduction

Stylised facts are consistent empirical findings which are accepted as truth and basis for theories. Nevertheless, there are usually, inaccuracies in these empirical regularities. This chapter examined some macroeconomic and financial stylised facts in the context of the developing economies of the WAMZ so as to determine if these facts hold in these economies. This is significant in highlighting the characteristics of the behaviours of these economies as precursor to specific empirical assessments of the feasibility of the region's monetary integration.

Over time, large body of literature in macroeconomic quantitative analytical research had established a good number of stylised facts in macroeconomic fluctuations and business cycles in many countries. These empirical regularities have been adapted as empirical basis for the formulation of many related theoretical models. This sub-section established some regularities in macroeconomic fluctuations in the WAMZ as a matter of significance and necessity for these countries coming together in monetary integration. Essentially, this chapter is a precursor chapter that laid some bedrocks foundation for empirical analyses and assessments performed in this research work as a whole by providing empirical tests that generated vital broad information about the characteristics of the economies of the WAMZ.

The objective of this chapter was to reveal some macroeconomic and financial characteristics and behaviours of the WAMZ member countries from the view-points of some relevant stylised facts and theories while simultaneously testing the validity of the stylised facts and theoretical proposition within the context of the developing economies of the WAMZ.

Informal economic activities which are strong features of the WAMZ economies were discussed to some extent in order to bring out the nature of the informal economies of the zone.

The first part of the analyses here was about macroeconomic stylised facts and some theoretical relationship propositions regarding macroeconomic fluctuations and business cycles, international parity relationships in purchasing power parity (absolute and relative), international Fisher effect and uncovered interest parity as well as Phillips curve and Lucas output-inflation trade-off. The second part dealt with some empirical regularities in exchange rates and the behaviours of foreign exchange markets while the last session looked into the banking sector characteristics as proxy for financial systems. These tests are all based on the WAMZ countries' economies.

3.2 Informal Economic Activities in the WAMZ

Informal economic activities are those market-based production of goods and services (legal or illegal) that are hidden from official authorities, and thus, escape detection in the official estimates of national income/products for regulatory, institutional and monetary reasons. Generally, the avoidance of governmental bureaucracy or regulatory burden are some of the regulatory reasons for informal economic activities. Monetary reasons may be about the avoidance of the payment of taxes and levies while institutional reasons may be weak legal system, weak rule of law, poor quality of political institutions and corruption.

For an economy, the degree of unreported/unrecorded economic activities causes lots of concerns because the high extent of the involvements of firms and households in activities that are hidden from government, the more the distortions in fundamental economic analyses. For instance, informal activities limits tax revenues as well as create bureaucratic and regulatory burdens. Apart from these, informal economic activities can have negative effects

on the efficiency and effective functioning of the formal economic sector as there is bound to be discrepancies between national expenditure and national income as well as discrepancies between official and actual labour force. Going by these attributes of an informal economic activities, it suffice to state that the WAMZ countries exhibit significant traces of informal economy which is concentrated in services, commerce, distribution, construction or locally sourced food production or raw materials. This informal sector provided a large proportion of employment and income for the WAMZ countries.

Although, it is believed widely that firms operating in informal sectors are usually small (family-operated) businesses, a striking feature of the West African informal sector is the presence of large informal firms/enterprises which are hugely successful in various weak business environments characterised by absence of regulations enforcement that encourages and allows these large firms in the informal sector to operate with impunity in many cases. There are cases of tax evasion and payment of pre-emptive tax within the informal sector. Because of lack of improvement in the African business environments in the real sense, many people prefer to operate in the informal sphere of the economy. It is suffice to add that it is expensive to be legal within African economies.

The incidence, size and magnitude of the informal economic activities in the WAMZ economies have serious economic (and political) consequences for the proposed monetary zone and its member economies. Some of these implications could be summarised as: declining tax revenue (owing to untaxed transactions), bias of social, economic and financial information, efficiency and productivity losses (arising from the competitive advantage of these informal activities), underreporting of income (due to large number of poor people which declare low income, but have substantial expenditure), distortions in the allocation of resources and significant welfare losses. However, some literature argued in favour of some potential benefits of informal economic activities which are apparent within the developing

economies of the WAMZ where around 66% of income generated from the informal economic activities is spent instantly in the formal economies (Schneider and Enste, 2002). Nevertheless, for the WAMZ economies, informal activities are sources of overall economic growth.

Worldwide, with the avoidance of government regulations (on minimum wages, taxation), the informal economy is more flexible and is better able to respond to market conditions and rapid changes than as obtained within the formal economy (Smith, 1994). Informal activities propel structural changes necessary for economic development because of the informal economy's quick adaptation to changes in economic situations. Furthermore, lower prices of goods and services within the informal economy may likely have some positive distributional effects when such informal activities are in favour of low-income earners (Portes et al, 1989). Because of deficiency in planning for reallocation of resources, some jobs are only available because their full cost (income tax) are too expensive to balance-off their consistently low level of productivity (Reyneri, 2003; Prager, 1983; and Carter, 1984).

Commonly, informal economy depicts small and unorganised producers operating on the fringes of the formal economy. However, in the case of Africa in general and the WAMZ specifically, reverse are the cases in which informal economies dominate the stagnant and static formal economies. In the WAMZ, informal economic activities play dominant roles (particularly in the area of employment) where small operators co-exist with very large politically well-connected informal enterprises that operate with impunity, as well as organised networks, with very little information on who is involved and the nature of involvement or business.

Due to the prominence of informal economic activities in the WAMZ, some of the discrepancies that manifests are: (i) underground hidden production (within the sphere of

legal activities) that create value-added but are deliberately hidden from government in order to avoid tax payments or to avoid meeting certain legal standards (minimum wages, maximum labour hours, health and safety issues and so on), or to avoid compliance with administrative procedures (completion of administrative forms and statistical questionnaire); (ii) illegal production which are productive activities that generate goods and services whose sales, distribution or possession are forbidden by law, or productive activities which are usually legal, but are illegal when performed by unauthorised procedures/producers; (iii) production by household (for own final use) which are productive activities that result in goods or services consumed or capitalised by the households that produce them. It is therefore suffice to state that the WAMZ's informal sector is a symptom of institutional deficiencies. Specifically, the large informal activities within the monetary zone are caused by failure of government to enforce regulation appropriate for large firms involved as well as the burden-some nature of regulation and taxation that inhibit compliance.

The reality of the informal economy in Africa holds constantly as the sector plays a central role in African economies. Studies revealed that sub-Saharan Africa (where informal activities account for around 80% of non-agriculture labour and nearly half of the GDP) is the most informal continent of the world. This sector accounts for a large share of GDP and huge share of employment. ILO (2014) estimation revealed that the sector employs around 90% of rural African employees, accounts for 80% of total labour force in African countries and 77.2% of workers in the sub-Saharan Africa were self-employed or own-account workers or contributing family workers while 66% are in non-agricultural employment.

Most key sectors of the WAMZ economies which are within the 'informal sector' are: commerce, handicrafts (artisans), agriculture, most manufacturing and transportation etc. Specifically, in the WAMZ, informality drives employment. Some largest and fastest growing sectors are informal economic sector as reflected in wholesale trade, retail trade (the

largest locus of informal activities), real estate, transportation, hospitality, construction, agriculture, artisan activities (carpentry, mechanics, painting, tailoring *etc*) as key. Most informal economic activities are highly mobile without fixed place of work, particularly, in the cases of street hawkers, traders on street pavements, travelling salesmen, including carpenters, mechanics, small scale business owners who generally, do not own or rent their workplace but occupy unused spaces and vacate whenever such spaces are needed by the rightful owners. This predominant nature of informal economic activities in the WAMZ serves as major factor inhibiting development in the sub-region. However, the informal sector only contribute as low as 3% of total tax collection, despite its economic relevance. The existence of large informal firms (which, though, meet the criteria for formal status) manifests the WAMZ's state failures as evident by corruption, weak enforcement capabilities of government, adverse business environment etc. These factors, among others, increase the costs (thus reduce the benefits) of businesses that operate formally within the monetary zone. Nonetheless, it is difficult to accurately determine how the informal sector drives the economies of the WAMZ countries. This is due to lack of data and absence of critical understanding of self-manifestation of informal activities in the region. Data on informal employment in Africa in general are scarce or not even available For instance, in the WAMZ, commercial motorcyclists are very core part of the whole economy, but there have been difficulties in capturing their value-added as well as harnessing their potentials. These and other factors thus make compilation of data of on these informal activities difficult and not properly handled as the trade hawker has no trading permit, many firms do not have regular and up-to-date books of account for the purposes of easy monitoring and taxation. According to Smith (1994), many large informal firms are skilful in producing falsified financial statements, misleading accounting certificates and several versions of financial statements

(differently for banks, government, their businesses) with the assistance of dubious accounting firms that specialise in these versions of accounting reports.[79]

Furthermore, from the financial services perspective, the WAMZ's informal sector is characterised by limited access to bank credit facilities and this causes operators in this sector to resort to informal credits from families and friends; and the critical factor causing this is the demand by banks for loan documents before loan applications are considered as it is practically difficult for operators in the informal sector to make those required documents available.

Discrepancies that are usually created by informal economic activities in the WAMZ countries are: (a) gaps between statistics on national expenditure and national income of the WAMZ countries if for tax purposes, operators in the informal sector can hide their income but not their expenditure. Large tax burden can likely encourage economic activities in the informal sector); (b) gaps between figures for official labour forces and actual labour force if official labour force participation declines while the total labour force participation is assumed constant. Unemployment (which is the lack of work in the formal sector) would prompt or force some people to work in the informal economic sector; (c) gaps between cash payment and increase in currency demand. This can be reveal in the currency outside bank/narrow money fraction of broad money because those involved in informal economic activities usually conduct their activities in cash.

Apart from domestic informal activities, informal cross border trade (which are international flows of goods that are not reported (or incorrectly reported) by customs authorities of a country) is a major form of overall informal economic activities in the WAMZ countries where goods pass through border posts with false customer declarations. Goods cross borders

[79] Versions of these accounts are evolved according to specific uses and they are easily certified by accounting firms who are usually part of the arrangement.

(either through border posts or elsewhere along the borders) without the knowledge of custom authorities. Within the WAMZ, casual observations reveal that informal cross border trade (ICBT) is thriving.

As it affects Africa continent generally and the WAMZ specifically, Golub (2014) established that a significant component of ICBT activities are re-exports in which goods are imported formally into a low-tax/low cost country with the intent of clandestinely trans-shipping them thereafter into the neighbouring countries with higher taxes, restrictive import quotas, costly trade facilitation services or higher regulatory standards. It is a long-time tradition to trade local primary products across borders in order to balance local shortages and stabilise prices, due to the need for livelihood and life sustenance caused by limited and shrinking formal employment opportunities. Generally, in West Africa, recorded intra-regional trade is small, but ICBT is pervasive, with re-export being particularly significant form of intra-regional trade. In recent days, ICBT in the WAMZ is viewed to be around 50% of intra-regional trade (Benjamin et al, 2015). More often, estimates of ICBT is in multiples of official cross-border trade. For instance, World Bank (2013) reported that in 2011 the bilateral trade of domestically-produced goods between Nigeria and Cameroon was $230 million, in comparison with officially-recorded flows of $10 - $40million.

Two features of African national boundaries (which as well, reflect in WAMZ's national boundaries) from which ICBT can be fully understand are: (i) the huge divergence in economic policies between neighbouring countries; and (ii) the ease of cross-border shipment of goods by informal operators. Consequently, due to these factors, smuggling flourishes in the WAMZ as a result of the contradictions between hugely unchallenged state authorities over borders and the ease with which informal operators evade borders. In West Africa, common re-export goods which are banned or are subject to high taxes in some countries within the sub-region are cars, clothes and clothing materials, cigarettes, sugar, rice,

vegetable oil, frozen poultry etc. Significantly, Benin and Togo are hubs for unofficial and illegitimate cross-border trade (due to their proximity to Nigeria, the largest economy in the region), serving as gateway to other countries within the sub-continent.

Medina and Schneider (2018), in a study on 'shadow economy' of 158 countries of the world over the period between 1991 and 2015, came up with robust estimates of the sizes of informal economic activities of the countries covered by the research study, adopting the new macro methods of Currency Demand Approach (CDA) and the Multiple Indicators Multiple Causes (MIMIC) approach. The results of the statistical estimations of the sizes of informal economies of the WAMZ, as percentages of the formal GDP, using the MIMIC method is as presented in Table 3.1 below.

Table 3.1: Summary Statistics of MIMIC Estimations of Sizes of Informal Economy (as Percentages of GDP) in the WAMZ (1991-2015)

Year	*Gambia*	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*S/Leone*	*WAMZ*
1991	50.60	46.07	41.22	42.08	56.95	38.20	45.85
1992	49.38	46.12	41.34	43.89	58.17	41.77	46.77
1993	49.46	47.71	41.16	44.70	58.82	43.77	47.60
1994	53.55	46.18	41.88	45.25	66.61	43.67	49.52
1995	56.73	44.98	41.75	45.55	62.21	44.51	49.29
1996	55.31	46.87	42.03	46.67	61.09	46.36	49.72
1997	54.35	44.65	41.32	45.12	60.69	46.60	48.79
1998	51.61	45.70	39.73	45.95	62.33	45.96	48.55
1999	48.35	44.58	40.14	44.64	59.87	48.49	47.68
2000	45.10	41.90	39.70	43.20	57.90	48.60	46.07
2001	43.36	42.62	39.12	42.23	57.64	50.14	45.85
2002	51.76	42.66	38.09	41.84	59.93	47.76	47.01
2003	42.85	42.60	39.01	43.02	57.19	45.34	45.00
2004	38.90	42.90	28.77	42.31	56.72	43.88	42.25
2005	45.77	43.16	37.54	42.47	55.84	43.45	44.71
2006	48.19	41.68	37.41	39.95	51.95	42.96	43.69
2007	47.90	41.51	38.30	42.71	54.96	40.92	44.38
2008	45.28	41.41	38.94	43.09	53.06	40.87	43.76
2009	39.78	40.61	42.16	43.45	53.98	40.60	43.43
2010	35.17	40.03	43.89	41.57	52.80	39.34	42.13
2011	48.57	40.64	39.60	41.52	51.51	36.12	42.99
2012	42.64	40.99	37.51	42.23	51.56	32.36	41.21
2013	40.95	39.25	38.32	42.37	51.70	25.69	39.71
2014	43.81	38.50	38.18	42.45	50.64	26.47	40.01
2015	43.64	39.37	41.58	43.67	52.49	34.18	42.49
Average	***46.88***	***42.91***	***39.95***	***43.24***	***56.67***	***41.50***	***45.19***

Source: Medina and Schneider (2018).

To generate these estimates, the predictor variables employed in the structural equation model of MIMIC were fiscal freedom, cash (currency), unemployment, rule of law, corruption control, per capita income growth, labour force participation, government stability, and trade openness in these countries. For the WAMZ member economies, the inclusion of these variables are justified. All things being equal, for instant, on per capita growth, a bigger informal economy can be associated with more economic activities getting off the formal economy thus resulting in decrease in economic growth. Lower official labour force participation signals higher informal activities while the more the cash (currency) used, the greater the extent of informal economic activities. The possibility of increased informal economic activities could also be caused by high unemployment rate. Corrupt practices are always associate with unofficial/informal activities while good rule of law enhances formal economic activities and reduces the level of informal activities.

3.3 Stylised Facts of Macroeconomics of the WAMZ

For the WAMZ countries, this section considers some macroeconomic stylised facts and theoretical propositions. These are: (i) some macroeconomic fluctuations in relation to business cycles from the view-point of the developing economies of the WAMZ and the developed economies of Germany, the UK and the US; (ii) international parity relationships in purchasing power parity (PPP) and international Fisher effect (IFE); (iii) Phillips curve; (iv) Lucas short-run output-inflation trade-off.

3.3.1 Macroeconomic Fluctuations and Business Cycles

In this study, fluctuations in macroeconomic variables were examined at the frequency of business cycle. This necessitated decomposing of these variables into trend (non-stationary) and cyclical (stationary) components. The reason for this is that specific empirical features of

these data (such cross-correlation) can only be valid if data are stationary. To de-trend the variables used here, and decompose these series into trend and cyclical components so as to remove long term trend and derive cyclical components which are stationary, the Hodrick-Prescott (HP) filtering method (with lambda=100 for annual data) was applied. The cyclical components of the variables of interest were applied to estimate volatility and co-movements (correlation) towards verifying the relevant stylised facts. These are meant to establish pro-cyclicality, a-cyclicality and counter-cyclicality in these variables. Within the context of the assessment here, volatility was taken to be aggregate fluctuations measures by standard deviation, while co-movement measure was by the magnitude of correlation coefficients. Positive correlation indicate pro-cyclicality while counter-cyclicality was deduced from negative correlation. Acyclicality is the situation of zero correlation.

Six major areas of stylised facts considered here for the WAMZ countries (as developing economies) and Germany, United Kingdom and the United States (as developed economies) are for: (1) output and income (real GDP and nominal GDP); (2) fiscal variables (government expenditure and revenue and fiscal impulse); (3) money and credit (money supply and velocity of money); (4) price (consumer price, inflation and nominal interest rates); (5) exchange rates (nominal US dollar exchange rates, nominal effective exchange rates and real effective exchange rates); and (6) foreign trade (merchandise trade balance). Velocity of broad money supply was derived by dividing nominal GDP by money supply (M3) while government expenditure was divided by government revenue to derive fiscal impulse. Merchandise trade balance was taken to be the difference between imports and exports of the countries evaluated. Variables evaluated were generally over the period between 1991 and 2015.

The results of the correlation of business cycles and the cyclical component of some monetary and exchange rates, fiscal and external trade variables in the nine countries assessed are as exhibited in Table 3.2 below

Table 3.2: Results of Correlation of Cyclical Components of Macroeconomic Variables and Business Cycles in the WAMZ and Three Developed Economies

	Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*S/Leone*	*Germany*	*UK*	*US*
Government Expenditure	0.33	0.78	0.19	0.93	0.03	0.27	0.14	0.17	0.55
Government Revenue	0.50	0.76	na	0.03	0.007	0.69	0.61	0.73	0.82
Fiscal Impulse	0.19	-0.14	na	-0.68	0.11	-0.09	0.13	0.05	0.11
Broad Money Supply (M3)	0.13	0.62	0.25	0.41	0.21	0.64	na	0.12	0.09
Velocity of Money	0.44	0.11	0.61	0.66	0.09	0.68	na	0.08	-0.41
Domestic Credits	0.35	0.31	0.61	0.99	0.39	0.30	0.05	0.33	0.59
Price (CPI)	0.02	0.004	0.46	0.66	0.006	0.46	0.35	0.64	0.05
Inflation Rate	0.35	0.09	0.08	0.22	0.03	0.76	0.03	0.17	0.64
Nominal Interest Rate	0.43	-0.30	0.19	0.98	-0.28	-0.08	0.72	0.67	0.55
Nominal (USD) Exchange Rate	0.15	0.28	0.20	0.70	0.20	0.42	na	0.66	na
NEER	0.02	0.47	na	na	0.36	0.37	0.35	0.73	0.13
REER	0.09	0.44	na	na	0.30	0.83	0.36	0.73	0.24
Imports	0.41	0.52	0.45	0.62	0.09	0.14	0.50	0.47	0.60
Exports	0.53	0.72	0.63	0.97	0.12	0.93	0.53	0.37	0.13
Merchandise Trade balance	0.47	0.17	0.16	0.91	0.12	0.80	0.45	0.34	0.83

Source: Author' Estimation, EIU Database and EViews 9.5Output

For the fiscal variables, the results for all the WAMZ countries revealed pro-cyclicality of fiscal variables of government expenditure and government revenue. However, both variables appeared acyclical in the case of Nigeria. Similar results were obtained for the three developed economies assessed. Although, the economic intuition here is that fiscal policy should be countercyclical, there have been evidences of fiscal policy pro-cyclicality being a stylised fact. When the fiscal impulse measure was analysed to reveal the net effect of government expenditure and revenue on real output, the correlation coefficients were negative (counter-cyclicality) only for Ghana, Liberia and Sierra Leone while other WAMZ countries, Germany, UK and the US exhibited pro-cyclicality. These indicate that during economic boom, governments of these countries increase expenditure and reduce tax revenue and in recession reduce expenditure and increase revenue. The correlation of monetary

variable (broad money) were pro-cyclical for all the countries evaluated, suggesting positive transmission of monetary shock to real economic activities. Pro-cyclicality of monetary variables is, however, a stylised fact. For the evaluation of velocity of money, the results showed pro-cyclicality for all countries, with the exemption of the US. The postulation of the QTM is that, given the pro-cyclicality of broad money, velocity of money is expected to be counter-cyclical. However, this holds only for the US which tended towards a-cyclicality in broad money. There was positive correlation in the cases of domestic credit for all the WAMZ developing economies and the three developed economies. This was expected as it indicated that domestic credits were made available for domestic economies in these countries, though very low (and tending towards a-cyclicality) for Nigeria.

In literature, the results of the tests of correlation between price and output have been mixed. In this respect, estimations in this study yielded positive correlation of domestic real output and both price and inflation rates, thus depicting pro-cyclical variations of price in the WAMZ countries and the developed economies under assessment. These showed that supply shocks dominantly influenced macroeconomic fluctuations in these economies. However inflation appears to be closely a-cyclical in Ghana, Guinea Nigeria and Germany. Nominal interest rate was expectedly pro-cyclical in the advanced economies of Germany, UK and the US and also in The Gambia, Guinea and Liberia. While the nominal US dollar exchange rate was pro-cyclical for all the countries examined; and both NEER and REER were equally positively correlated with domestic real output for the four WAMZ countries whose data for these analyses were available. This same result was obtained for the three developed economies examined. The positive correlations of these exchange rate variables are stylised facts. Nevertheless, the positive correlation for The Gambia in NEER and REER were low and tending towards a-cyclical status for these variables. For the foreign trade variables of imports and exports, the relationships with domestic output were positive for all the nine

countries. However, merchandise trade balance is deemed to be an adequate measure of foreign trade transactions; and the correlation of this series with real domestic output for all the WAMZ countries and three developed countries were pro-cyclical. There might be a link between domestic output and exports or this might be due to the insensitivity of imports of these countries to fluctuations in domestic demands. This positive relationship is very strong in Liberia, Sierra Leone and the US.

Table 3.3 below highlights the results of the assessment of the stylised facts on the volatility of cyclical components of seven selected macroeconomic variables estimated for the WAMZ countries and the developed economies of Germany, the UK and the US. In this context, it is a stylised fact that the cycles of macroeconomic variables are more volatile in developing economies than in developed economies.

Table 3.3: Results of Volatility (Standard Deviations) of Cyclical Components of Macroeconomic Variables of the WAMZ and Three Developed Economies

	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***	***Germany***	***UK***	***US***
Nominal Interest Rate	4.34	5.06	2.51	0.38	3.11	10.41	1.02	1.10	1.42
Nominal (USD) Exchange Rate	3.24	0.10	401.74	8.47	15.57	175.17	na	0.04	na
NEER	25.79	144.44	na	na	113.40	66.67	2.88	7.41	0.52
REER	13.74	13.48	na	na	45.49	10.74	3.90	7.57	5.04
Velocity of Money	63.09	8.50	5.05	26.39	10.63	30.13	na	2.11	1.67
Price (CPI)	2.76	4.06	4.49	2.54	2.59	2.27	0.86	1.10	0.76
Inflation Rate	20.50	13.69	7.72	6.17	68.56	19.19	0.72	1.56	0.52

Source: Author' Estimation and EViews 9.5Output

It is apparent and clear from the results displayed above that variabilities of the macroeconomic series examined were lower in the developed economies of Germany, the UK and the US than the developing economies of the WAMZ, thus supporting this stylised fact.

On the overall, results generated through estimations and analyses here were mixed, however, there some appreciable volumes of supports for the stylised fact assessed in this sub-section.

3.3.2 International Parity Relationships – PPP, IFE and UIP

Parity condition gives intuitive explanations of the movements in price and interest rates in different markets in relation to exchange rate. Theoretically, exchange rate (spot and forward) are influenced by interest rates and inflation. Therefore, international parity conditions (which are core to international finance) are economic theories linking exchange rate, price levels and interest rates together. They are key relations applied in predicting movements in exchange rates. Four (4) parity conditions exhibiting interlinkages are: (i) Relative Purchasing Power Parity, (ii) Fisher Effect (close); (iii) International Fisher Effect (open); and (iv) Interest Rate Parity. Commodity market inflation (changes in price level) affect market interest rate which in turn, through interest rate parity, affect exchange rates. Though, to some degree, these theories logically explain exchange rate fluctuations, however, they are not too strong because they are based on some assumptions that could be challenged. Some of these assumptions are: free flow of goods, services and capital which do not hold true in the real world. Nevertheless, parity conditions are expected to hold in the long run, but not always in the short run.

The law of one price (LOOP) states that in a competitive market (free of transportation costs and official trade barriers – tariffs), identical goods sold in different countries must sell for same price when their prices are expressed in terms of the same currency. This law buttresses the important principle in trade theory that in a situation of ‘open trade’ and ‘costless trade’, identical goods must trade at same relative prices regardless of where they are sold (Krugman et al, 2015). The tendency of identical goods to sell for identical prices globally generates a link between exchange rate and prices. As prices change globally, it is necessary to exchange rate to also change in order to keep the prices measured in a common currency equal across countries. This adjustment of exchange rate to offset differing inflation rates between countries is the reason for exchange rate changes (Husted and Melvin, 2013). This

relationship between exchange rate and price level is the purchasing power parity (PPP) which explains the movement in the exchange rate between currencies of two countries by price level changes in these countries.

Purchasing Power Parity: The PPP theory states that the exchange rate between two countries' currencies equals the ratio of the countries' price levels. The prediction of PPP is that an increase (decrease) in the purchasing power of the domestic currency (as depicted by decrease (increase) in the domestic price level) will be associated with a proportional currency appreciation (depreciation) in the foreign exchange market. The PPP theory can be expressed in an equation as:

$$E = P - P^* \qquad 3.1$$

where E is exchange rate, P and P^* are price levels in the domestic and foreign countries respectively. The assertion of PPP is that there is equality in price levels of all countries when measures in terms of same currency.[80]

Although, the PPP equation may reflect the idea of LOOP, they are however, different. While LOOP applies to the individual commodity, PPP relates to the general price level. For every commodity, if LOOP hold true, PPP must hold automatically so far the reference basket of goods that estimates price levels in different countries are the same. An affirmation of PPP is that even when the LOOP is true literally, economic forces behind it will assist it to equalise purchasing powers in all countries (Krugman et al, 2015).

There is absolute PPP and there is relative PPP. Absolute PPP (which is the strong-form-PPP) is the expression in Equation 3.1 that exchange rate is equal to relative price levels where the variables involved are transformed into logarithmic forms. This version of PPP holds that by

[80] This is a crucial assertion for an economic bloc aiming at monetary integration and a common currency.

comparing prices of a bundle of goods in two different countries (with conversions by exchange rate into a common currency measure), the price will then be equal. Drawing from Equation 3.1, the algebraic expression of the absolute PPP is:

$$E = \frac{P}{P^*} \qquad 3.2$$

where the variables are not transformed into logarithm. Relative PPP (which is the weak-form PPP) states that the percentage change in the exchange rate between two currencies over a period of time equals to the difference between the percentage changes in national price levels. What this denotes is that that relative PPP begins with absolute PPP and then transform Equation 3.2 into percentage changes thus:

$$\%\Delta E = \%\Delta P - \%\Delta P^* \qquad 3.3$$

Relative PPP accounts for market imperfections. As acknowledged by the proponents of the PPP theory, the absolute PPP is not likely to hold because of the existence of transport costs, trade impediments, distortion effects of tariffs, quotas and protections, imperfect information and competition etc., while it is argued that relative PPP can hold even in the presence of these highlighted problems. The argument of relative PPP is that exchange rate will adjust by the amount of inflation differentials between two economies. In the consideration of market imperfection, relative PPP, which is the long run path on which exchange rate moves with inflation is tested in this chapter.

Many empirical studies have reached the conclusion that PPP hold better in the long run than in the short run and that there can be prolonged and substantial deviations in the long run (Ardeni and Lubian, 1991). On the overall, it was argued that PPP holds better for traded goods than for non-traded goods (Officer, 1976). A stylised fact and major empirical regularity is that non-traded goods are usually more expensive in rich countries than in poor countries once the prices are converted into a common currency (Pilbeam, 2018). This is a

vital point. Furthermore, the PPP theory holds better for relatively high inflation countries and underdeveloped capital markets. High-inflation countries' currencies (relative to their trade partners) tend to experience rapid depreciation that reflects such high inflation, thus suggesting that PPP is a dominant foreign exchange rate determinant in such countries. PPP may not hold generally because of confounding effects through other factors that are determinants of exchange rate.

Husted and Melvin (2013) stressed that developing economies have very low prices for many goods and services when measured in terms of developed countries' currencies (such as the US dollar). In these developing economies, when overall economic activities are measured at market exchange rate, domestic products are understated. Furthermore, common findings show that PPP holds better for countries having high trade openness and perform poorly for countries with significant trade barriers. Because of the postulation that PPP holds better when countries concerned are geographically close and trade linkages are high (according to Frankel, 1981), in testing the validity of international parity relationships, this study generates thirty (30) pairs of bilateral nominal exchange rates in which all the six WAMZ countries, each serves as home economies to each other five member countries.

Because price level data are non-existing, the available consumer price indices (which is index numbers whose value is 100 during the base year of the data) are commonly used. For both domestic and foreign countries, consumer price index (CPI) are constructed as:

$$CPI_t = \frac{P_t}{P_0} \qquad 3.4$$

where P_t and P_0 are the consumer price level at time t and the base year respectively. If the home country's CPI is divided by foreign country's CPI, this results into:

$$\frac{CPI_t}{CPI_t^*} = \left(\frac{P_t}{P_t^*}\right) X \left(\frac{P_0^*}{P_0}\right) \qquad 3.5$$

where $*$ depicts the foreign country. Assuming the absolute PPP in Equation 3.2 holds in the base year, the actual exchange rate in the base year equals to the PPP exchange rate for the base year. An empirical measure of PPP exchange rate by cross multiplying terms in Equation 3.5 thus:

$$E_t = E_t PPP = E_0 \left(\frac{CPI_t}{CPI_t^*}\right) \quad 3.6$$

As a commonly used technique which involves the correlation of the actual exchange rates movements and the PPP counterpart, Equation 3.6 allows for the test of the validity of PPP (Husted and Melvin, 2013). This PPP exchange rate which re-establishes PPP relative to the base period offsets the relative inflation between a pair of countries, in consideration of the base period.

A further way of assessing long run PPP is to investigate the stationarity of real exchange rate (RER). The assumptions of absolute PPP is that RER is constant. The RER is nominal exchange rate adjusted for national prices. If the RER is stationary, any percentage change in price levels would be offset by equal magnitude of nominal exchange rate depreciation/appreciation. If RER contains unit roots, this then means that RER shocks are permanent with a further implication that PPP does not hold. For this purpose, bilateral RER were estimated for the WAMZ countries as:

$$q = s\left(\frac{p}{p^*}\right) \quad 3.7$$

where q is real exchange rate.

Here, PPP is tested under the null hypothesis that RER is a random walk (that is, RER contains unit root and not stationary) against the alternative hypothesis that RER is stationary (Messe and Rogoff, 1988 and Mark, 1989). Although, the unit root tests of RER were performed 'with and without time trend', it is more appropriate to apply the model without

trend in determining the stationarity of RER. This is because the inclusion of linear time trend is not theoretically consistent with long run proposition of PPP. Some empirical studies also suggested the inconsistency of time trend in RER with the PPP hypothesis (Culver and Papell, 1999; Holmes, 2002; Zhang and Lowinger, 2006; Acaravci and Acaravci, 2007)

International Fisher Effect: According to the Quantity Theory of Money (QTM), in the long run, money supply growth causes changes in price, while it is a general consensus among economists that money supply growth does not affect real variables in the long run. Consequently, real interest rate should not be impacted by money supply growth. If this holds, all inflation changes must be reflected in the nominal interest rate. The explanations of the 'Fisher Effect' is on how the nominal interest rate is affected by changes in inflation, in response to money supply growth. This thus reflects the effect of money supply growth on the nominal interest rate as clearly expressed in the QTM and Fisher equation. Fisher effect is therefore an expression that allows for the impact of inflation on nominal interest rate, in which increasing inflationary expectations causes increasing nominal interest. The Fisher equation is expressed as:

$$r = i - \pi^e \qquad 3.8$$

Where r is real interest rate, i is nominal interest rate and π^e is expected inflation. 'Fisher Effect' depicts one-to-one relationship between nominal interest rate and inflation rate. This was brought to the fore by Irving Fisher who theorised a direct relationship between inflation rate and nominal interest rate. According to this postulation, all things being equal, a rise in a country's expected inflation rate will eventually cause an equal rise in interest rate, and vice versa. A currency with high rate of inflation should also bear interest rate higher than a currency with lower rates of inflation.

This is the one-to-one relationship between nominal interest rate and inflation in 'Fisher Effect' expressed thus:

$$i = \pi^e \qquad 3.9$$

This Fisher effect for a domestic economy while the foreign version of this equation can be stated as:

$$i^* = \pi^{e*} \qquad 3.10$$

From the UIP condition and the Fisher hypothesis, there is a theoretical suggestion that currencies with higher interest rates depreciate because higher nominal interest rate reflects higher expected inflation. This is what the international Fisher effect (IFE) suggests. In order to clearly understand how relative nominal exchange rates changes among countries affect a country's currency, it is necessary to recollect and consider the implications of the theories of PPP and Fisher effect. The implication of PPP is that exchange rate will move in order to offset changes in inflation rate differential. Therefore, a rise in a domestic inflation rate relative to that of a foreign country should associate with a fall in the value of the home country's currency. Secondly, this should also associate with a rise in the domestic country's interest rate. When these two conditions are put together, there will be IFE which is also known as Fisher effect (open). It can therefore be stated that IFE equals to the combination of the PPP and Fisher effect (closed).

International Fisher Effect (IFE) hypothesises that interest rate differentials in based on inflation differences. The higher the interest rate, the higher the inflation rate which subjects a currency to the weaker condition of depreciation. IFE therefore portends that differences in nominal interest rate between two countries should be proportional to depreciation or appreciation of the currencies of the two countries. The international Fisher effect (IFE) is an

economic and exchange rate model applied in predicting nominal exchange rate movements between two or more foreign currencies based on the relationship between the prevailing interest rate in these countries.

Just like the PPP theory, IFE conjectures that interest rate differentials (and not inflation differential) influences exchange rate changes. IFE also states that an estimated change in the current exchange rate between any two currencies is directly proportional to the difference between the nominal interest rate of these two countries as a particular time. As earlier indicated, there is the hypothesis is that the real interest rate in an economy is independent of monetary variables and with the assumption that rates are calculated across countries, it can be inferred that a country experiencing lower (higher) interest rate will also experience lower (higher). Consequently, IFE estimated exchange rate are equally based on nominal interest rates relationships. If IFE theory explains the relationship between interest rates and exchange rate, it impliedly proposes interest rate differential as a prediction of the future changes in spot exchange rate.

Automatically, nominal interest rate differentials reflects inflation differential by a no-arbitrage system or by a PPP. This depicts that there is close relationship between PPP and IFE due to the high degree of correlation between interest rate and inflation rate. What IFE is therefore saying is that the currency of a country reflecting lower (higher) interest rate should experience appreciation (depreciation) relative to the currency of the country bearing higher (lower) interest rate. These show that there is proportional relationship between depreciation/appreciation of currency, prices and nominal interest rate differential. This link between interest rate, inflation and exchange rate is provided by IFE.

However, the validity of IFE depends largely on capital market integration which implies free flows of capital across markets. This is however problematic in developing economies like

the WAMZ economies (unlike developed economies). Given the foregoing explanations, international Fisher Effect can be expressed as:

$$\%\Delta e = \left(\frac{1+i_d}{1+i_f}\right) - 1 \qquad 3.11$$

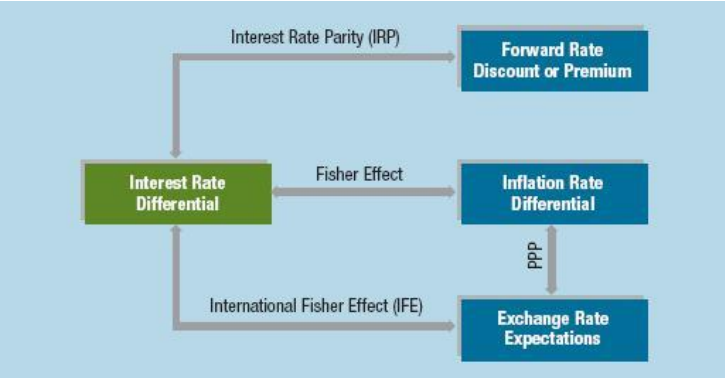
or

$$\%\Delta e = \left(\frac{i_d - i_f}{1+i_f}\right) \qquad 3.12$$

where Δe is the percentage change in exchange rate, i_d and i_f are the domestic and foreign nominal interest rates respectively. Δe will be positive if $i_d > i_f$, implying that domestic currency will depreciate relative to the foreign currency due to high inflationary expectations in the domestic country. On the other hand, if $i_d < i_f$, Δe will be negative. These therefore connote positive relationship between exchange rate changes and interest rate differentials.

The position of IFE is that the nominal exchange rate between two countries should adjust for nominal interest rate differentials. These adjustment can occur either through (i) international capital flow (international money market) or trade and flow of goods. Therefore, free capital mobility is a condition for IFE to hold. Because the IFE theory is based on the PPP theory, the IFE theory might not hold due to the same reason that caused the PPP theory not to hold in the presence of other factors (other than inflation) affecting exchange rate movements and thus prevent exchange rate from adjusting according to the dictates of inflation differentials. Figure 3.1 below reflects the interlinkages between these international parities.

Figure 3.1: Interlinkages in International Parities Relationships



Going by the foregoing analyses and the interconnectivity of the parity conditions and with the consideration of model Equations 3.9 and 3.10 above, IFE can be expressed and estimated as the relationship between relative nominal interest rates and relative inflation thus:

$$(i - i^*) = (\pi - \pi^*) \qquad 3.13$$

where * indicate the foreign variables.

Interest rates parity is state that interest rate differential between two countries is equal to the difference between the spot and forward exchange rates. The covered interest rate parity (CIP) is a condition that the price of risk-free asset having an identical maturity should be equal across countries after being translated into a common currency. This is arbitrage condition. The uncovered interest rate parity (UIP) occurs when the difference between interest rates equals to the difference in the spot exchange rate. If IFE states that change in exchange rates have to do with expected differences in interest rate, which means that the market will react in trying to achieve the UIP.

Uncovered interest rate parity (UIP) states that exchange rate will change at a rate that offsets the interest rate differential. The UIP condition is such that expected rate of depreciation or appreciation of an exchange rate is equal to the interest rate differential between two the countries affected. Thus, UIP is expressed as:

$$\%\Delta E = i - i^* \qquad 3.14$$

Where ΔE is the expected rate of depreciation or appreciation of the domestic country's currency in a direct quotation system while i and i^* are the domestic and foreign interest rates respectively. Higher interest rate is expected to cause depreciation while low interest rate leads to currency appreciation. What UIP says is that expected change in foreign exchange price offsets the difference in the nominal rates of returns. Nevertheless, UIP does not imply CIP. The requirements of UIP goes beyond friction-free financial markets. Investors may be indifferent about currency denomination of their financial assets so far these assets have same expected returns, even regardless of the volatility of these returns. Specifically, the investor may care less about currency risks involved. Such risk neutrality stance denotes 'perfect substitutability' of financial assets which is the implication of the UIP. Therefore, UIP is a relationship that must hold when domestic and foreign financial assets are perfect substitute in the situation of capital mobility. This is an assumption of monetary models of exchange rate determination.

Suppose an investor within the WAMZ is considering buying an assets denominated in a foreign currency within the region has options of investing this fund in either Nigerian bonds or Ghanaian bonds having same risk and maturity postures. With these options before the investor, he/she should therefore bear two factors in mind: (i) the interest rate on the Nigerian bonds and the Ghanaian bonds; and (ii) the expectation of what happens to the naira-cedi exchange rate. Because these bonds have equal risks, he/she can instantaneously switch between the two bonds. What make the difference between the two financial assets in this case is the currencies in which they are denominated and the related interest rates. If such international investor is a Nigerian who is contemplating the purchase of a Ghanaian bond while expecting the Nigerian currency (naira) to depreciate (lose its value) against the Ghanaian currency (cedi) as he holds the bonds, this will cause a rise in his expected Nigerian naira returns from holding the Ghanaian bond. These are the ideas of UIP. The real return

from holding the Nigerian (domestic) interest bearing asset is the difference between interest rate and inflation ($i - \pi$). Therefore, this real return from domestic interest bearing assets is transformed into the deviation of domestic inflation from the sum of foreign inflation and expected exchange rate appreciation/depreciation ($i^* + \Delta E - \pi$). This is what UIP entails.

Data and Methods: To serve as a precursor to the empirical assessments of exchange rate determination in the WAMZ countries, efforts in this section was limited to the test for the validity of the Absolute and Relative PPP as well as the IFE postulations. Investigations of simultaneous validity of these theories in the cases of the six WAMZ countries were performed. In these respects, these necessitated the investigation of both directions of bilateral relationship of the six countries of the WAMZ in which these countries at one point or the other, serve as 'domestic country/currency' against respective 'foreign country/currency'. These constitute thirty pairs or bilateral relationships.

Quarterly data of money market interest rates, consumer price index (CPI) for a period of 21 years between 1995 and 2015 were sourced from the databases of World Bank, IMF and EIU and applied for this study. For the WAMZ countries assessed, absolute PPP should imply cointegration between the nominal exchange rates and relative foreign and domestic prices; relative PPP should connote cointegration of changes in nominal interest rates and changes in relative foreign and domestic prices; while IFE should require cointegration between nominal interest rate differentials and inflation differentials. As an initial step, Equation 3.7 was estimated to generate the PPP exchange rates for the WAMZ countries in order to investigate the levels of equality of PPP exchange rates and market exchange rates of the WAMZ and further establish the degree of deviations (if any) of these rates from each other and as well establish the degree of association (correlation) of these two exchange rates over the 15-year period (between 2001 and 2015) covered by the validity tests. For the purpose of the cointegration estimations, the Augmented Dicky-Fuller (ADF) and Phillip-Perron (PP) unit

root tests were performed at the first stage to check for the order of integration of the variables employed in the cointegration analyses because residual-based cointegration tests require all variables (at least the dependent variable) to be to an integration order of one. Fully modified least square (FMOLS) cointegrating regression were performed for each of the 30 bilateral relationships and the residuals of these FMOLS estimation results were tested for unit root/stationarity under the residual-based single equation cointegration methods which require the residuals to be stationary if the variables are cointegrated to be The econometric variants of Residual-based cointegration tests (Phillips Ouliaris and Park's Added Variables Tests) and the statistical methods of Pearson Moment Correlation and were appropriately applied. While Phillips Ouliaris tests the null hypothesis of no cointegration against the alternative hypothesis of cointegration, Parks' Added Variable Tests were applied to test null hypothesis of no cointegration. The cointegration tests were performed at 1% level of significance.

*Results and Findings***:** The deviations of the estimated annual PPP exchange rates and market exchange bilateral exchange cross-rates across the WAMZ countries as well as the results of estimates of the strength of association of these two forms of exchange rates over a period of fifteen years are exhibited in Table 3.4 below. The Pearson Product-moment correlation estimation of the degrees of association of the two classes of exchange rate (reported in percentage translations of the correlation coefficients) were very high (at over 90 percentages) and positivity moved towards same direction. These portend close linear association of the market exchange rates and the PPP theoretically predisposed exchange rates across the WAMZ.

Table 3.4: Deviations of PPP Exchange Rates from Market Exchange Rates and Correlation Estimates in the WAMZ (2001-2015)

	Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*S/Leone*
2001	0.22	-2.68	na	12.50	45.51	na
2002	0.23	0.27	na	21.21	47.55	na
2003	0.17	6.05	na	15.64	47.80	na
2004	0.13	5.02	118.72	8.97	41.69	na
2005	0.06	3.22	943.99	7.85	27.31	na
2006	0.00	3.00	1625.19	6.81	19.64	-129.89
2007	-0.04	-0.80	-10.69	5.81	14.12	-371.06
2008	-0.03	-3.63	-196.23	0.46	-1.46	-515.84
2009	0.09	-0.45	-239.52	0.64	14.56	-386.34
2010	0.00	0.00	0.00	0.00	0.00	0.00
2011	0.00	1.00	-77.93	-2.86	-6.75	231.03
2012	0.21	3.01	-618.34	-5.08	-20.05	43.58
2013	0.21	5.67	-1477.43	-5.81	-32.50	-139.75
2014	0.91	10.16	-2038.88	-5.83	-43.29	-81.14
2015	1.35	8.82	-2293.78	-10.20	-27.33	173.00
% Correlation	***95.98%***	***96.65%***	***94.06%***	***96.45%***	***90.11%***	***96.72%***

Source: Author's Estimations

Regarding the investigations of the PPP (absolute and relative). IFE and UIP, results of the various unit roots tests of variables employed in the tests of validity of the international parity conditions are reported in Appendices 3.1 to 3.4.

Virtually all the WAMZ countries' variables for the cointegration tests of relative PPP were stationary, and this makes cointegration tests inappropriate in these respects. Consequently, this study resorted to the application of the Pearson Product-Moment correlation estimations of the terms of relative PPP for the 30 bilateral relationship across the WAMZ in order to establish the strength of linear association between percentage changes in exchange rates and percentage changes in inflation differentials. The stronger the association of these two variables of relative PPP, the closer the Pearson correlation coefficient will be to either +1 or -1 depending on whether the relationship is positive or negative, respectively.

Table 3.5: Results of Residual-based Cointegration Tests of Absolute PPP in the WAMZ

		Phillips-Oualiaris Tests		*Park's Added Variable Tests*
Home Country	***Foreign Country***	***tau-statistics***	***z-statistics***	***Chi-square***
GAMBIA	***Ghana***	-2.587	-12.845	4.361
	Guinea	-2.631	-9.963	95.023*
	Liberia	-2.450	-9.635	133.507*
	Nigeria	-2.750	-12.999	14.341*
	S/Leone	-2.336	-10.365*	12.748*
GHANA	***Gambia***	-1.756	-9.396	23.709*
	Guinea	-0.682	-2.126	185.207*
	Liberia	-1.766	-6.416	76.931*
	Nigeria	-1.222	-4.560	25.446*
	S/Leone	-2.213	-8.730	32.718*
GUINEA	***Gambia***	-2.205	-7.813	76.586*
	Ghana	-1.568	-5.824	99.751*
	Liberia	-2.693	-12.656	20.389*
	Nigeria	-2.816	-15.684***	9.118*
	S/Leone	-2.857	-15.327***	7.328**
LIBERIA	***Gambia***	-8.634	-2.270	113.668*
	Ghana	-3.218***	-14.280	52.801*
	Guinea	-3.111	-13.590	33.036*
	Nigeria	-3.827**	-21.751**	14.939*
	S/Leone	-1.812	-6.325	21.964*
NIGERIA	***Gambia***	-2.199	-8.990	10.900*
	Ghana	-3.323***	-20.677**	10.627*
	Guinea	-3.169***	-16.066***	8.900*
	Liberia	-4.159*	-24.895*	13.671*
	S/Leone	-2.735	-12.381	6.387**
SIERRA	***Gambia***	-2.331	-10.310	7.311*
	Ghana	-1.893	-6.645	14.412*
	Guinea	-2.846	-15.424**	3.661
	Liberia	-1.773	-6.345	19.971*
	Nigeria	-2.664	-11.481	5.013***

Source: Author's Estimation and Eviews 10 Output

The outcome of the Phillips-Ouliaris and Park's Added Variable residual-based cointegration tests for absolute PPP across the WAMZ are highlighted in Table 3.5 above. For most bilateral absolute PPP relationships (except for The Gambia/Sierra Leone and Nigeria/Liberia). The test statistics (tau and z) yielded by the Phillip-Ouliaris tests failed to reject the null hypothesis of no cointegration (that is, unit roots in the residuals) at 1% level of significance. Apart from The Gambia/Ghana and Sierra Leone/Guinea relationships, the chi-square statistics produced for all the WAMZ countries revealed that the Park's Added Variable tests reject the null hypothesis of cointegration of the series at 1% level of significance. These two residual based cointegration tests consequently provided evidence to suggest that the absolute PPP does not hold across the WAMZ. The results of further ADF

and PP (with constant only) unit roots tests of bilateral RER as exhibited in Table 3.6 below show that the null hypothesis of unit roots cannot be rejected for virtually all the WAMZ countries at 1% level of significance (except for some cases of three The Gambian-based RER and Liberia/ Guinea RER).

Table 3.6: Results of ADF and PP Unit Roots Tests of Real Exchange Rates

		ADF		*PP*	
Home Country	***Foreign Country***	*With Constant*	*With Constant & Trend*	*With Constant*	*With Constant & Trend*
GAMBIA	***Ghana***	-8.059*	-4.493*	-15.018*	11.576*
	Guinea	-6.448*	-4.457*	-7.897*	-5.285*
	Liberia	-1.847	-3.468***	-1.881	-2.190
	Nigeria	-7.032*	-5.886*	-6.948*	-5.816*
	S/Leone	-2.554	-2.459	-2.306	-2.010
GHANA	***Gambia***	3.441	2.108	4.033	2.173
	Guinea	-3.918*	-4.564*	-2.519	-2.308
	Liberia	2.876	0.395	3.017	0.305
	Nigeria	0.743	0.935	1.485	-0.511
	S/Leone	0.473	1.935	0.872	-1.059
GUINEA	***Gambia***	-1.847	-1.499	-1.824	-1.648
	Ghana	-2.414	-2.525	-1.908	-1.837
	Liberia	-2.086	-1.527	2.060	-1.527
	Nigeria	-2.523	-2.342	-2.337	-1.555
	S/Leone	-1.785	-2.492	-2.028	-2.103
LIBERIA	***Gambia***	-1.863	-2.069	-1.951	-2.158
	Ghana	-1.658	-5.991*	-0.243	-3.704**
	Guinea	-4.940*	-3.420**	-5.035*	-3.457**
	Nigeria	-2.805**	-3.221**	-2.850*	-3.282***
	S/Leone	-3.313**	3.416**	-2.181	-2.193
NIGERIA	***Gambia***	-1.585	-2.175	-1.619	-2.295
	Ghana	-2.390	-3.900**	-2.357	-3.076
	Guinea	-6.589*	-8.228*	-7.269*	-4.932*
	Liberia	-3.044**	-3.380**	-3.032***	-3.435***
	S/Leone	-2.871***	4.800**	1.950	-2.401
SIERRA	***Gambia***	-2.361	-2.312	-2.050	-1.950
	Ghana	-1.334	-2.973	-0.580	-1.908
	Guinea	-2.221	-3.614**	2.815***	-3.498***
	Liberia	-3.458**	3.540**	-2.156	-2.101
	Nigeria	-2.743**	3.894**	-1.966	-2.401

Source: Author's Estimation and Eviews 10 Output

This consonance hugely confirmed the residual-based cointegration test results that the long run absolute PPP does not hold in WAMZ countries. The relative PPP correlation tests results in Table 3.7 below generally reflected low and medium linear association between changes in exchange rates and in relative price changes differentials. These results are not encouraging in giving supports for relative PPP across the WAMZ.

Table 3.7: Results of Correlation Tests of Relative PPP in the WAMZ

Home Country	*Foreign Country*	Correlation	*Home Country*	*Foreign Country*	*Correlation*
GAMBIA	***Ghana***	0.35	***LIBERIA***	***Gambia***	0.36
	Guinea	0.64		***Ghana***	-0.00
	Liberia	0.40		***Guinea***	0.36
	Nigeria	0.07		***Nigeria***	0.20
	S/Leone	0.00		***S/Leone***	0.17
GHANA	***Gambia***	0.33	***NIGERIA***	***Gambia***	0.04
	Guinea	0.56		***Ghana***	0.05
	Liberia	0.01		***Guinea***	0.54
	Nigeria	0.10		***Liberia***	0.23
	S/Leone	0.34		***S/Leone***	-0.21
GUINEA	***Gambia***	0.63	***SIERRA***	***Gambia***	-0.02
	Ghana	0.58		***Ghana***	0.34
	Liberia	0.38		***Guinea***	0.42
	Nigeria	0.56		***Liberia***	0.19
	S/Leone	0.49		***Nigeria***	-0.19

Source: Author's Estimation and Eviews 10 Output

On the overall, these PPP tests indicate that the validity of both absolute and relative PPP could not be established in the WAMZ, thus making PPP to be irrelevant in the exchange rate determination throughout the WAMZ.

In Table 3.8 below, the results of Phillips-Ouliaris and Park's Variable Added residual-based cointegration tests for IFE depict that across the WAMZ, the null hypothesis of no cointegration of nominal interest rate differentials and inflation differentials cannot be rejected at 1% significance level in the Phillips-Ouliaris tests which thus produced evidence to infer that IFE failed to hold for these WAMZ's bilateral relationships. It is significant to state at this point that these results yielded supports for the conjecture that if PPP fails to hold, IFE will not hold. However, there were mixed (and contradictory) output yielded by the Chi-square statistics of the Park's Variable Added tests at 1% significance level.

Table 3.8: Results of Cointegration Tests for International Fisher Effects in the WAMZ

		Phillips-Oualiaris Tests		*Park's Added Variable Tests*
Home Country	**Foreign Country**	***tau-statistics***	***z-statistics***	***Chi-square***
GAMBIA	***Ghana***	-2.273	-10.169	0.346
	Guinea	-1.617	-7.309	0.577
	Liberia	-2.100	-9.110	46.700*
	Nigeria	-2.222	-10.222	5.367**
	S/Leone	-1.061	-4.476	4.405**
GHANA	***Gambia***	-2.273	10.169	0.346
	Guinea	-0.993	-3.134	0.182
	Liberia	-2.208	-10.479	35.007*
	Nigeria	-2.983	-15.925	0.066
	S/Leone	-1.383	-5.803	1.079
GUINEA	***Gambia***	-1.616	-7.309	0.577
	Ghana	-0.993	-3.134	0.082
	Liberia	-1.310	-3.164	26.331*
	Nigeria	-1.593	-4.901	5.348**
	S/Leone	-2.338	-9.626	11.572
LIBERIA	***Gambia***	-2.100	-9.110	46.700*
	Ghana	-2.208	-10.479	35.007*
	Guinea	-1.310	-3.164	26.331*
	Nigeria	-3.165***	-17.105***	9.447*
	S/Leone	-2.399	-12.945	0.001
NIGERIA	***Gambia***	-2.222	-10.222	5.368**
	Ghana	-2.983	-15.925	0.066
	Guinea	-1.594	-4.901	3.673**
	Liberia	-3.165***	-17.105***	9.447*
	S/Leone	-1.477	-5.806	1.483
S/LEONE	***Gambia***	-1.062	-4.476	4.405
	Ghana	-1.383	-5.803	1.079
	Guinea	-2.339	-9.626	11.572*
	Liberia	-2.399	-12.945	0.001
	Nigeria	-1.477	-5.806	1.483

Source: Author's Estimation and Eviews 10 Output

The results of the tests of Pearson moment correlation for UIP in the WAMZ are as exhibited in Table 3.9 below. The results revealed weak positive and negative correlations between exchange rate changes (appreciation and depreciation) and interest rate differentials across the WAMZ. The strongest of the linear association of 0.56 was recorded in the case of Guinea/Nigeria.

Table 3.9: Results of Correlation Tests for Uncovered Interest Rate Parity (UIP) in the WAMZ

Home Country	*Foreign Country*	Correlation	*Home Country*	*Foreign Country*	*Correlation*
GAMBIA	***Ghana***	0.14	***LIBERIA***	***Gambia***	-0.01
	Guinea	-0.04		***Ghana***	0.24
	Liberia	0.04		***Guinea***	0.04
	Nigeria	-0.01		***Nigeria***	-0.01
	S/Leone	-0.06		***S/Leone***	-0.06
GHANA	***Gambia***	0.15	***NIGERIA***	***Gambia***	0.08
	Guinea	0.23		***Ghana***	0.06
	Liberia	0.27		***Guinea***	0.07
	Nigeria	0.16		***Liberia***	0.05
	S/Leone	0.11		***S/Leone***	-0.16
GUINEA	***Gambia***	-0.03	***SIERRA***	***Gambia***	-0.07
	Ghana	0.27		***Ghana***	-0.04
	Liberia	0.11		***Guinea***	-0.27
	Nigeria	0.56		***Liberia***	-0.09
	S/Leone	-0.31		***Nigeria***	-0.14

Source: Author's Estimation and Eviews 10 Output

Nevertheless, on the overall these results gave evidences to infer that UIP does not hold across the WAMZ.

3.3.3 Inflation-Unemployment Relationship – Phillips Curves

Philips Curves indicate the relationship between inflation and unemployment rates in an economy. The notion here is that changes in the level of unemployment have direct and predictable effect of price inflation. This was propounded by A.W. Philips in his study of annual wage inflation and unemployment in the United Kingdom between 1860 and 1957 in which Phillips found a consistent and stable inverse relationship between these two variables when he plotted the related scatter diagram. This had since been adopted as macroeconomic tool. Many economists (after Phillips) who performed similar studies based on other economies got similar results thus making Phillip's proposition a stylised fact. The basis of the logical argument behind Phillip curve is that (i) a fiscal stimulus and increase in aggregate demand would sequentially increase demand for labour as government spending grows; (ii) there would be fall in pool of unemployed; (iii) firms would compete for the few workers by increasing nominal wages; (iv) there would be greater bargaining for labour to seek increase in nominal wages; (v) cost of wages will increase; and (vi) the increased cost of wages will

be passed on to increases in price levels. This thus became a stylised fact which is verifiable in many economies. To verify if the Phillip curve relationship hold in the WAMZ economies, statistical estimations of Pearson Moment Correlation of the CPI inflation rate and unemployment rates across the WAMZ were performed applying annual data covering the period between 1991 and 2015. The resulting coefficients of correlation revealed the direction (and strength) of the relationship between the two variables involved. Table 3.10 below displays the results of the correlation estimation to establish if the Phillip curve relationship hold in the WAMZ countries (as developing countries) and the US (as a developed economy).

Table 3.10: Results of Correlation Analysis of Phillip Curve Relationship in the WAMZ

	Inflation/Unemployment Correlation Coefficient
Gambia	0.05
Ghana	-0.02
Guinea	0.36
Liberia	0.17
Nigeria	0.13
S/Leone	0.006
US	-0.28

Source: Author's Estimation and EViews 9.5 Output

Among the WAMZ countries, the results revealed very weak inverse relationship only for Ghana at -0.02 (apart from the negative relationship in the case of the US at -0.28). These are evidence to conclude that the Phillip curve relationship does not hold in the WAMZ (apart from Ghana) over the period covered by this study.

3.3.4 Lucas Short-run Output/Inflation Trade-off

Lucas (1973) hypothesised that average output will not be altered by the rate of inflation. The Lucas' Phillips Curves Hypothesis' implies that the condition for the output-inflation trade-off was the misinterpretation by economic agents, of their observed price movements. In his cross-country study of 18 countries for the period between 1953 and 1967, Lucas found out that in high inflation countries, there is a quick reflection of changes in aggregate demand on

price while the effects on output are relatively small. In countries with low inflation or rather, price instability, the initial effect of increase in nominal incomes on real output are large while the positive effects on inflation rate is small. The simple indication of these is that as there is increase in the variance of inflation, the trade-off between output and inflation will deteriorate because of the ability of economic agents in high inflation countries to distinguish between nominal shocks and real shocks. Lucas (1973) was of the view that unanticipated inflation is the condition upon which there can be a trade-off between output and inflation. His position was that there will be alteration to the behaviours of economic agents if the general price level movements are erroneously taken to be an indication of relative price changes. Such change in the behaviour of economic agents will cause employment and real output to fluctuate around their 'natural' levels. The moment these economic agents are able to know that changes in price are not market specific but general, each of the real variables would be forced to move back to the initial level because of homogeneity of degree zero of the supply functions. What the Lucas model of Phillips curves connotes is the inverse relationship between the real output response and the variability of inflation and aggregate demand. The objective of this section was to test the validity of the Lucas model of Phillips curve and determine if it holds in both the formal economies and the informal developing economies of the WAMZ.

For the assessment of output/inflation trade-off which covers the period between 1991and 2015, annual data for nominal GDP, and real GDP were collected for the six WAMZ countries. Estimations of output/inflation trade-off for the WAMZ countries were carried the model suggested by Lucas (1973):

$$lny_t = \alpha + \tau\Delta x_t + \lambda lny_{t-1} + \gamma T + \varepsilon_t. \qquad 3.15$$

Where y_t is log of real GDP; Δx_t is first difference of the log of nominal GDP; λy_{t-1} is one-period lag of log real GDP; T is time trend ($0 < \tau < 1$ and $\lambda < 1$). Equation 3.15 has been widely used by the new classical (Lucas, 1978) and new Keynesian economists (Schultze, 1984; Ball et al, 1998 etc.) as an empirical fact. The parameter of interest (which is the trade-off parameter and a measure of the slope of Phillips curve) is the parameter of change in nominal output ($\tau \Delta x_t$). It determines how much of shock to nominal income shows up in real output. A large coefficient indicates that changes in nominal output growth are associated with real output in the short run. A coefficient close to unity indicates a shallow Phillips curve, meaning that all changes in nominal output show up in real output growth while a coefficient value close zero depicts a very steep Phillip curves which indicates that all changes in nominal income show up in price. This theoretical model suggests that in countries experiencing high variances in inflation rate and nominal output growth rate, the trade-off parameter should be low, hence a steeper Phillip curves.

The results of the OLS estimations of output-inflation trade-off in the WAMZ (including the diagnostic tests) are displayed in Table 3.11 below. Nominal output growth (the parameter interest) reported positive coefficients for all the countries assessed, but significant only for The Gambia and Liberia. The diagnostic tests show that for all the estimations, there are no residual serial correlation and heteroscedasticity problems while normality problem are established in the cases of Ghana, Liberia and Nigeria.

Table 3.11: Results of the Estimation of Short-run Output-Inflation Trade-Off for the WAMZ Countries 'Formal' Economies

Dependent Variable: Real Output						
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Constant	13.1839*	1.5221	1.4544	-1.1136	7.0958**	9.1765**
∆Nominal Output	**0.2771***	**0.0183**	**0.0062**	**1.1197***	**0.0415**	**0.1571**
Lagged Real Output	0.4289**	0.9346	0.9516*	1.0592*	0.7665*	0.6779*
Time Trend	0.0193	0.0052	0.0002	-0.0085	0.0170**	0.192*
R2	0.99	0.99	0.99	0.98	0.98	0.95
DW-Statistics	1.92	1.25	2.10	1.52	1.76	1.92
F-Statistics	0.00	0.00	0.00	0.00	0.00	0.00
Diagnostic Tests						
JB Statistics for Normality	0.5637 (0.75)	20.379 (0.00)	0.3581 (0.84)	12.7078 (0.00)	111.974 (0.00)	4.6689 (0.10)
Breusch-Godfrey Autocorrelation	0.0193 (0.98)	1.5417 (0.24)	1.3242 (0.29)	1.3916 (0.27)	0.1267 (0.88)	0.9447 (0.41)
Breusch-Pagan-Godfrey Heteroscedasticity	0.6751 (0.57)	1.2086 (0.33)	0.9109 (0.45)	1.0929 (0.38)	1.3018 (0.30)	0.7230 (0.55)

Source: Author' Estimation and EViews 9.5Output

Note: *, ** and ** denote 1%, 5% and 10% levels of significance respectively. The p-values are in parentheses.

Table 3.12 below exhibits the rates of variations in inflation and GDP growth as well as the OLS estimated trade-off parameter.

Table 3.12 Variabilities and Trade-off Parameter in WAMZ Countries' 'Formal' Economies (1991-2015)

Variability& Trade-off Parameter	***Gambia***	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Nominal Income Growth	5.82	15.60	9.85	23.75	31.31	13.88
Inflation Rate	4.60	14.90	9.84	7.92	31.28	20.23
Trade-off Coefficients	0.28	0.02	0.01	1.12	0.04	0.16

Source: Author's Estimations

To verify the stylised fact of the positive correlation of high output growth/inflation variabilities and low output-inflation trade off parameter over the period covered by this assessment for the formal economies of the WAMZ, it is evident in Table 3.6 above that this could well be established for Ghana and Nigeria exhibiting high variations in output and inflation and corresponding low output-inflation trade-off coefficients. However, this failed in the cases of Guinea with low variabilities of inflation (9.84) and nominal GDP growth (9.85) displaying the lowest trade-off parameter. For Liberia, reporting the highest significant trade-off parameter of 1.12, the stylised fact holds only for the country's inflation variation of

7.92 and not for the high variability of 23.75 in nominal output growth. For the Gambia having the WAMZ lowest variabilities in both nominal output (5.82) and inflation (4.60), it is expected that the trade-off parameter be higher than 0.28 generated, if the stylised fact is to hold. On the other hand, for this same reason it is expected that the trade-off parameter for Sierra Leone be higher than the 0.16 yielded.

Further to the investigations of the output-inflation trade-off for the formal economies of the WAMZ, assessments of the informal economies were equally performed. Data for nominal income, real income and inflation were generated for the informal economies of the WAMZ in relation to informal activities estimations as percentages of GDP, derived by Medina and Schneider (2018) and presented in Table 3.1. The results of the OLS estimations of the trade-off coefficients for the informal economies are presented in Table 3.13 below, highlighting the trade-off coefficients as significant at 1% level of significance for Ghana and Nigeria respectively. The coefficients for Sierra Leone was not statistically significant. The diagnostic tests revealed residual normality problem only for The Gambia and Guinea. While there were no heteroscedasticity issue for these OLS estimations, autoregression of the residuals was reported only for The Gambia. The goodness-of-fit were reasonable and the estimations are all jointly significant.

Table 3.13: Results of the Short-run Output-Inflation Trade-Off Estimations for the WAMZ's Informal Economies

Dependent Variable: Real Output						
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Constant	5.1841	2.2468	-4.7285	-3.4909	9.1143*	9.4870*
∆Nominal Output	**0.6641***	**0.2434****	**0.5961***	**1.0683***	**0.2864*****	**0.1342**
Lagged Real Output	0.7229*	0.8979*	1.2226*	1.1744*	0.6307*	0.5270
Time Trend	0.0635	0.0071	-0.0777	-0.0038	0.0243*	0.1561*
R2	0.99	0.93	0.94	0.97	0.98	0.95
DW-Statistics	1.53	1.10	1.76	2.27	2.08	2.02
F-Statistics	0.00	0.00	0.00	0.00	0.00	0.00
Diagnostic Tests						
JB Statistics for Normality	19.5446 (0.00)	0.5018 (0.78)	9.4054 (0.00)	0.2037 (0.90)	6.007 (0.05)	0.3126 (0.85)
Breusch-Godfrey Autocorrelation	6.3929 (0.00)	2.3375 (0.12)	0.5158 (0.61)	1.9757 (0.19)	0.9415 (0.41)	0.3888 (0.68)
Breusch-Pagan-Godfrey Heteroscedasticity	0.7921 (0.51)	1.4194 (0.74)	1.7848 (0.18)	2.6485 (0.10)	3.7680 (0.37)	1.2546 (0.32)

Source: Author' Estimation and EViews 9.5Output

Note: *, ** and ** denote 1%, 5% and 10% levels of significance respectively. The p-values are in parentheses.

Comparative results of the OLS estimated trade-off coefficients, rates of variations in inflation and GDP growth as reported in Table 3.14 below glaringly reveal that the Lucas output-inflation trade-off conjecture could not hold clearly in the informal economies of the WAMZ.

Table 3.14 Variabilities and Trade-off Parameter in WAMZ's 'Informal' Economies (1991-2015)

Variability& Trade-off Parameter	***Gambia***	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Nominal Income Growth	9.97	9.66	19.19	11.09	15.51	12.57
Inflation Rate	13.29	6.36	7.61	3.75	17.97	12.29
Trade-off Coefficients	0.66	0.24	0.60	1.07	0.29	0.13

Source: Author's Estimations

Although, the closest, Nigeria and Sierra Leone generated high nominal income growth variabilities of 15.51 and 12.57 respectively and the corresponding high inflation variabilities of 17.97 and 12.29 respectively, these two countries could only yield trade-off coefficients of 0.29 and 0.13 respectively. These results were not as sharp and 'clear-cut' as what were generated for the formal economies.

Consequent upon these, it could be inferred here that the Lucas output-inflation trade-off hold better in the formal economies of the WAMZ than the informal economies.

3.4 Stylised Facts of Exchange Rates and Foreign Exchange Markets Behaviour

As background to the study of exchange rate and markets behaviours within the WAMZ, it is essential to have initial insights into the trends in the historical developments of foreign exchange markets and regimes with which the six WAMZ countries operated over the years. Table 3.14 below summarises the historical trend of exchange rate regimes across the WAMZ. The historical developments of exchange rate regimes of the WAMZ countries (as highlighted above) reveal that the WAMZ countries adopted various mixed exchange rate regimes over the years, particularly during the post-1973 floating exchange era. The common feature is that virtually all the WAMZ economies operate floating exchange rate regime (pure, free or managed) over the period covered by various assessments and analyses in this thesis. The full narratives of these historical developments of foreign exchange markets and exchange rate regimes in the WAMZ are in Appendix 3.5 of this thesis reports.

Financial markets generally trend in manners in which yields or prices of financial market instruments usually show some behaviour, characteristics and features that can be generalised, given the nature of the time series (univariate or multivariate). Exchange rates are time series of foreign exchange markets within financial markets. Many empirical studies on the behaviour of exchange rate and foreign exchange market across developed, emerging and developing economies have established many regularities which are stylised facts. The common trend in literature is that stylised facts of exchange rates and market development are drawn mainly from empirical findings based on researches on developed and few emerging economies.

Table 3.15: Summary of Historical Development of Exchange Rate Determination and Regimes in the WAMZ

The Gambia	
Exchange Rate Regime/Method of Exchange Rate Determination	***Period***
Fixed Exchange Rate System	1955-1985
Floating Exchange Rate System (IFEM)	1990
Introduction of Parallel Market – Bureau de Change (BDC) and dual Exchange System	1990-2003
Dual Exchange Rate System Scrapped	2003
Ghana	
Exchange Rate Regime/Method of Exchange Rate Determination	***Period***
Fixed Exchange Rate Regime (Pegged to British Pound)	1957-1966
Fixed Exchange Rate Regime (Pegged to US Dollar)	1966-1982
Multiple Exchange Rate System	1983-1986
Dual Exchange Rate System – Dual Retail Auction	1986-1987
Dutch Auction System	1987-1988
Foreign Exchange Bureaux	1988-1989
Wholesale and Interbank Systems	1990-1992
Interbank Foreign Exchange Market	1992
Guinea	
Exchange Rate Regime/Method of Exchange Rate Determination	***Period***
Fixed Exchange Rate System (pegged to dollar and SDR)	1958-1985
Creation of Second Foreign Exchange Market/Weekly Auction	1985
Flexible Exchange Rate Regime and IFEM Weekly Auction	1994-2000
Monthly Auction System	2000-2002
Fixed Exchange System (pegged to dollar)	2002-2004
Stoppage of Monthly Auction/Reintroduction of Weekly Auction and Arithmetic Average Exchange Rate System	2005
Liberia	
Exchange Rate Regime/Method of Exchange Rate Determination	***Period***
Dollarised Economy – Extensive use of Foreign Currency	1847-1980s
Fixed Exchange Rate Regime (pegged to US dollar)	1981-1997
Free Floating Exchange Rate System	1998-2000
Managed Floating Exchange Rate Regime	2000
Nigeria	
Exchange Rate Regime/Method of Exchange Rate Determination	***Period***
Fixed Exchange Regime (Pegged to British pound sterling/US dollars)	1960-1986
Floating Exchange Rate System & Second-tier Foreign Exchange Market (SFEM)	April 1987
Creation of Interbank Foreign Exchange Market (IFEM)	January 1989
Autonomous Foreign Exchange Market	1995 - 1999
Interbank Foreign Exchange Market	1999-2002
Dutch Auction System (DAS)	2000- 2006
Wholesale Dutch Auction System (wDAS)	2006-2013
Retail Wholesale Dutch Auction System (rDAS)	October 2013
Interbank Foreign Exchange Market (Closure of Official Window)	February 2015
Sierra Leone	
Exchange Rate Regime/Method of Exchange Rate Determination	***Period***
Fixed Exchange Rate Regime (Pegged to British Pound)	1964-1978
Fixed Exchange Rate Regime (linked to the IMF's Special Drawing Rights)	1978-1982
Dual Exchange Rate Regimes	1982-1983
Fixed Exchange Rate (Unification of the Dual Rates)	1983-1986
Managed/Floating Exchange Rate Regimes	1986-1990
Free Floating Exchange Rate Regime	1990 to date

Source: Author's compilation

The following sub-sections discuss eight of these known stylised facts and empirical regularities of exchange rates and foreign exchange markets as well as what obtain about them in the WAMZ countries.

***(I) Absence of Normality*:** It is a known assertion that percentage changes in nominal exchange rate and exchange rate returns do not exhibit normal distribution.

Table 3.16: Statistical Properties of US Dollar Nominal Exchange Rate Returns and Percentage Changes for the WAMZ Countries (1995M1-2015M12)

Nominal US Dollar Exchange Rate Returns						
	Ghana	***Gambia***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Skewness	0.29	-0.67	-0.36	-0.71	13.24	1.28
Kurtosis	14.77	11.01	21.63	13.27	197.48	10.33
JB Stat.(p-values)	0.00	0.00	0.00	0.00	0.00	0.00
Observations	298	298	298	298	298	298
Nominal US Dollar Exchange Rate Percentage Change						
	Ghana	Gambia	Guinea	Liberia	Nigeria	S/Leone
Skewness	0.76	-0.24	0.64	0.13	15.53	1.64
Kurtosis	12.51	10.47	22.45	13.17	254.62	11.31
JB Stat.(p-values)	0.00	0.00	0.00	0.00	0.00	0.00
Observations	298	298	298	298	298	298
Nominal US Dollar Exchange Rate						
	Ghana	***Gambia***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Skewness	1.45	0.36	0.53	0.49	-0.39	0.16
Kurtosis	5.00	1.99	1.69	2.13	1.66	1.89
JB Stat.(p-values)	0.00	0.00	0.00	0.00	0.00	0.00
Observations	299	299	299	299	299	299

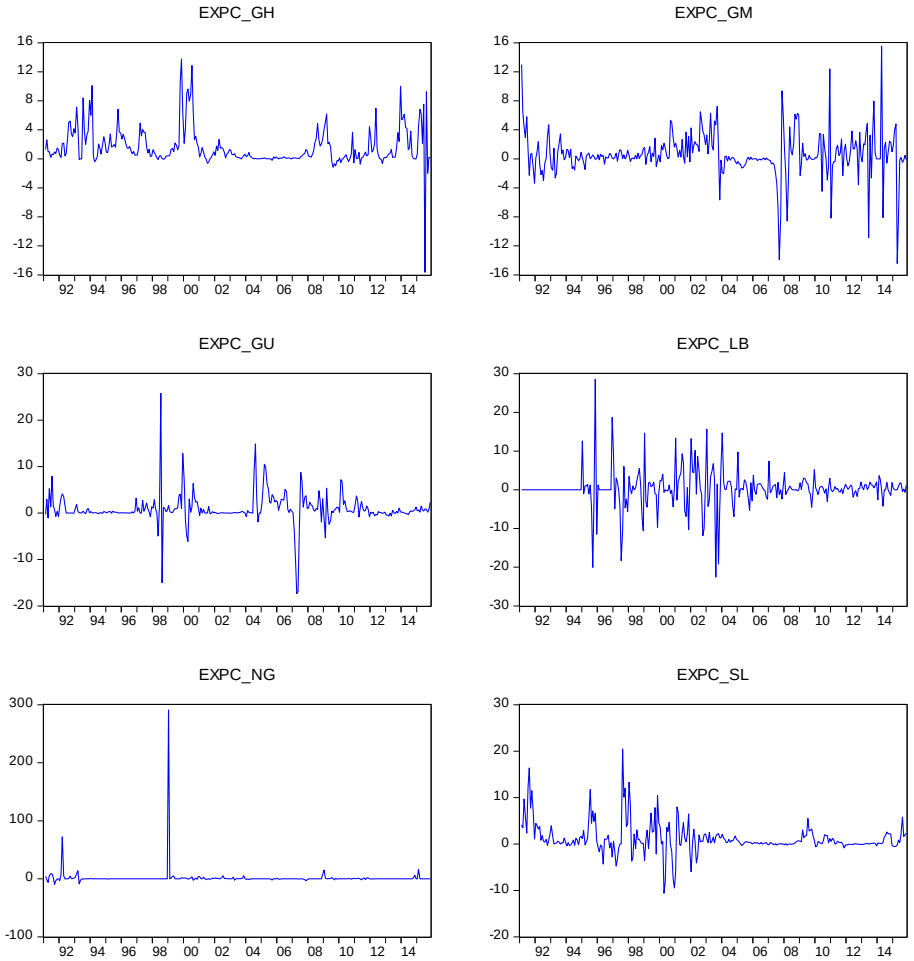
Source: Author's Estimation, EIU Database and Eviews 9.5 Output

The summary statistics of the properties of monthly nominal exchange rates and exchange returns (1995M1 to 2015M12) for the WAMZ countries are shown in Table 3.16 above. The J-B statistical tests of normality clearly confirm with the stylised fact in all the cases of the WAMZ countries where they yielded p-value of 0.00 for nominal exchange, exchange rate returns and exchange rate percentage changes in which the null hypothesis of normal distribution is rejected.

***(II) Persistence and Clustering of Volatility*:** Volatility of exchange rate is persistent. High and low variations in exchange rates can last for some period and this causes volatility clusters which are observed periods of high and low volatility. The reason attributed to volatility clustering in many research studies is 'fat tail distribution' which emanates from

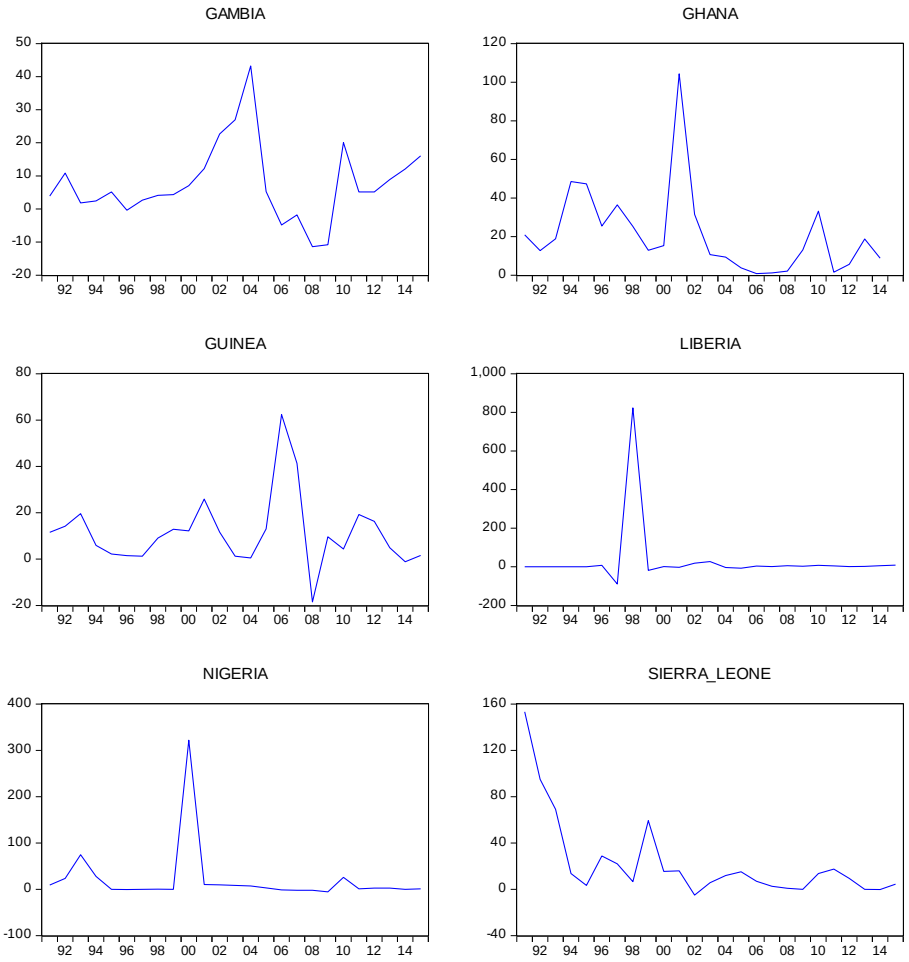
excess kurtosis in non-normal distribution, which are on the overall prompted by the nature of the financial data (Clark, 1973) and switch from the ideas of fundamental and technical analysts in times of uncertainties (Lux and Marchesi, 2000). Evidences that this stylised fact holds are apparent in the plots of percentage changes of the WAMZ countries in Figure 3.2 below.

Figure 3.2: Plots of Monthly Nominal US Dollar Exchange Percentage Change for the WAMZ Countries (1991M1 to 2015M12)



Source: Authors Estimation and EViews 9.5 Output

Figure 3.3: Plots of Annual Nominal US Dollar Exchange Percentage Change for the WAMZ Countries (1991-2015)



Source: Authors' Estimation, EIU Database and EViews 9.5 Output

(III) Volatility and Frequency of Data: The nature of volatility of explained by specific frequency of data. Some characteristics of percentage change or exchange rate return as well as volatility clustering show-up in the uncertainties in the market aggregates in low frequency time series (Diebold, 1988). Figure 3.3 above exhibits annual percentage changes in the nominal US dollar exchange rates of the WAMZ countries over same period covered by higher frequency (monthly data) in Figure 3.2 above. The fact in this empirical regularity are apparent when comparison is made between the volatility in both plots (covering same period of time), given the different frequencies.

(IV) Asymmetric Effects: Generally in financial markets, it is established that there are always 'leverage effects' which are indications of when high volatilities are always preceded

by currency depreciation, which is a downward movement in percentage change in financial data which may be due to financial risks emanating from fall in prices. These are made very clear in Figure 3.3 virtually in all the countries except for Nigeria where this is less pronounced.

***(V) Presence of Unit Roots (Non-stationary) in Floating Nominal Exchange Rate*:** For two freely floating currencies, the nominal exchange rate and the logarithm of the nominal exchange rate are non-stationary, but stationary at the first difference.

Table 3.17: Results of the ADF Unit Root Tests of Annual US Dollar Nominal Exchange Rates of the WAMZ Countries (2000-2015)

	Nominal Exchange Rate (at Level)	*Log of Nominal Exchange Rate (at Level)*	*First Difference of Log. Nominal Exchange Rate*
Gambia	-2.5618	-0.5374	-5.3469*
Ghana	-1.5119	-0.7038	-5.1798*
Guinea	-1.8510	-0.6442	-4.9862*
Liberia	-2.1408	-3.8378*	-12.1478*
Nigeria	-2.1345	-1.7711	-4.9348*
S/Leone	-1.9765	-7.4731*	-4.3683*
Critical values of ADF Unit Roots Test			
1%	***5%***		***10%***
-3.9591	-3.0810		-2.6813

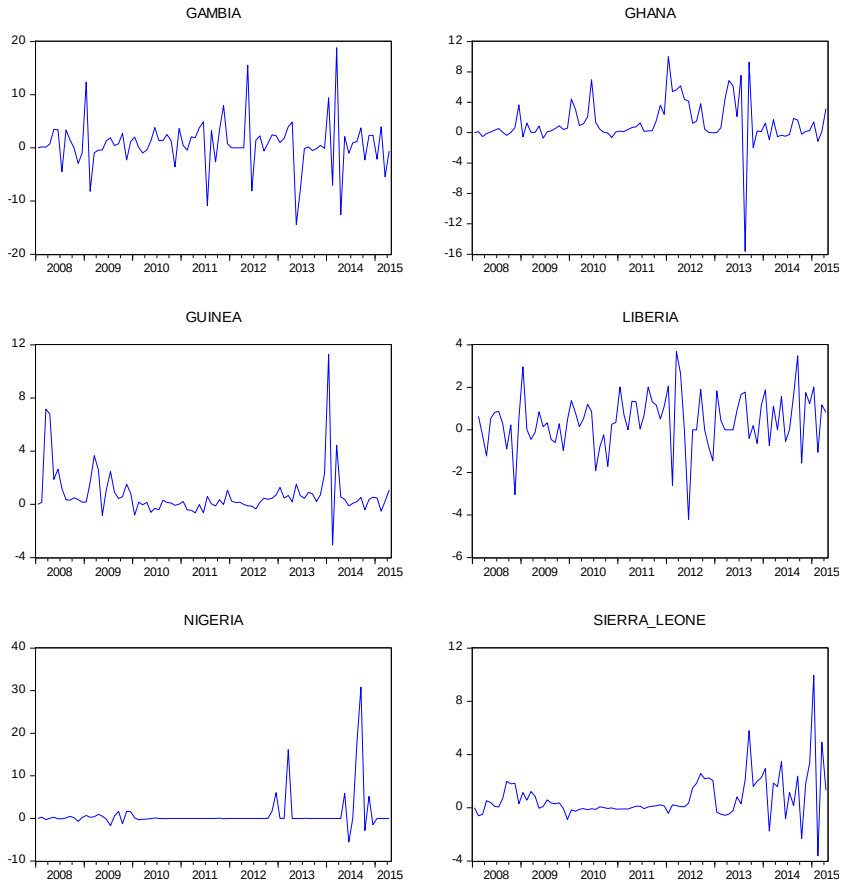
Source: Author's Estimation, EIU Database and EViews 9.5 Output

The output in Table 3.17 above reflect the stylised facts in point apart from the cases of Liberia and Sierra Leone which have stationary logarithm of their nominal exchange rate. Guinea, Liberia and Sierra Leone were known to have some forms of fixed arrangement in the par relationship with the US dollars in the history of exchange rate system developments trends, up till the 1980s and 1990s. This is a further confirmation of this stylised fact.

(VI) Calendar Effects or Regular Events: Empirical studies have established that the time of trade effects are significant in foreign exchange markets. Weekends and holidays are regular events that impact the volatility of exchange rates. It is empirically established that exchange rate volatility is lower during holidays and weekends than what obtain during trading week days because of the accumulative effects of information during holidays and weekends (Miller, 1988 and Abraham and Ikenberry, 1994). In developing economies (as the WAMZ),

exchange rate volatility is commonly influenced by general elections and effects of politics when monetary and fiscal policies are relaxed to appease voters, particularly during an election year.

Figure 3.4: Plots of Monthly Nominal US Dollar Exchange Percentage Change for the WAMZ Countries (2008-2015)



Source: Author's Estimations, IMF Database and Eviews 9.5 Output

Figure 3.4 above displays plots of US dollar monthly nominal exchange rate percentage changes across the six WAMZ countries between 2008 and 2015. Seasonal celebrations like Christmas is a regular event as the close of the year in most WAMZ countries. These charts establishes the empirical regularity of seasonal holidays causing exchange rate to witness different degrees of volatility before and beyond the festive period. This are usually caused by high levels of demand for imported goods around this period, thereby causing exchange rate to depart from its equilibrium point due the excess demand for foreign exchange.

(VII) Dominance of the Effects of Macroeconomic News: It is stylised fact that there is link between information and news about macroeconomic fundamentals (like inflation, money supply, interest rate and output) and volatility of exchange rate. The significant connection between German deutschemark/US dollar exchange rate and announcement made on macroeconomic fundamental of the US was established by Andersen and Bollerslev (1998). However, the evidence gathered by Kim et al (2004) is that it is the contents of macroeconomic news that influence exchange rate behaviours and market reactions and not the actual release of the news. Findings by Laakkonen (2007) relate to the nature of the macroeconomic news in which evidence was gathered to conclude that exchange rate volatility is increased by bad news than by good news; and that volatility is increased by conflicting news than by consistent news. Furthermore, this stylised fact was verified in the case of the Nigerian US dollar bilateral nominal exchange rate returns by estimating the Threshold GARCH (TGARCH) and the Exponential GARCH (EGARCH) models of this exchange returns.

In the TGARCH (1,1), the conditional variance for the WAMZ countries is specified as:

$$\sigma_t^2 = \delta + \alpha_1 \mu_{t-1}^2 + \beta_1 \mu_{t-1}^2 d_{t-1} + \gamma_1 \sigma_{t-1}^2 \qquad 3.16$$

where d_{t-1} takes the values of 1 if $\mu_t < 0$, and the value of 0 if $\mu_t \geq 0$. β_1 is the asymmetry or leverage term. The positive shocks (good news) and the negative shock (bad news) have different effects. When there is positive shock, the effect on volatility is α_1, while in the case of negative shock, the effect of volatility is $\alpha_1 + \beta_1$. Therefore, there is larger effect of bad news (negative shocks) on the conditional variance σ_t^2 than positive shocks. If $\beta_1 > 0$, this indicates asymmetry while $\beta_1 = 0$ means the effect of the news is symmetric and the model

collapses to the standard GARCH model.[81] Exponential GARCH (EGARCH) allows for asymmetries testing. The specification of EGARCH (1,1) could be modelled as:

$$\log(\sigma_t^2) = \delta + \beta_1 \ln(\sigma_{t-1}^2) + \gamma_1 \left(\frac{\mu_{t-1}}{\sqrt{\sigma_{t-1}^2}} \right) + \alpha_1 \left[\frac{|\mu_{t-1}|}{\sqrt{\sigma_{t-1}^2}} - \sqrt{\frac{2}{\pi}} \right] \quad 3.17$$

where δ, α, β and γ (the leverage term) are the parameters to be estimated. The left hand side of the equation is the log of the conditional variance series. This makes the leverage effect to be exponential rather than quadratic and thus makes the estimates of the conditional variance to be non-negative. The implications of the signs of the symmetry parameter in these two asymmetric GARCH model (TGARCH and EGARCH) is that there is larger impact of bad news or negative shocks on volatility foreign exchange returns than good news or positive shocks when the asymmetry parameter (γ) yields significant positive signs in TGARCH and significant negative signs in EGARCH. Table 3.18 below displays the results of the GARCH (1, 2), TGARCH (1, 2) and EGARCH (1,2) models estimations for the Nigerian naira/US dollar exchange returns.

Table 3.18: Results of the Estimations of the TGARCH (1,2) and EGARCH Models for US Dollar/ Nigerian Naira Exchange Rate Returns

Parameters	***TGARCH (1,2)***	***EGRACH (1,2)***
δ	1.26E-06**	1.261*
α	0.334*	0.374*
β (-1)	0.573*	0.825*
β (-2)	0.133	0.082
γ	-0.140**	0.056
Log likelihood:	21149.76	20937.90
No of Observations:	5064	5064

Source: Author's estimations and Eviews 7 Output
Note:*At 1% Significance level; ** at 5% Significance level; *** at 10% Significance level.

[81] Another simple extension of GARCH is the GJR model which incorporates additional term to account for possible asymmetries. The conditional variance GJR GARCH (1,1) is expressed as $= \delta + \alpha_1 \mu_{t-1}^2 + \beta_1 \sigma_{t-1}^2 + \gamma_1 \mu_{t-1}^2 I_{t-1}$, where I_{t-1} takes the value of 1 if $\mu_{t-1} < 0$ and the value of when otherwise. For the WAMZ countries, the GJR GARCH model is not employed.

The TGARCH (1,2) for the Nigerian naira/US dollar exchange returns estimation results show negative and significant (at 5% level of significance) coefficient of asymmetry (γ) of -0.140 and a positive but insignificant coefficient of asymmetry (γ) of 0.056 in EGARCH (1,2). The inference from these is that there are asymmetries in the news/shocks in the Nigerian foreign exchange markets. Bad news has larger influence on the volatility of foreign exchange returns in Nigeria than good news. This stylised fact holds in this case.

(VIII) Non-isolation of Exchange Rate from Markets Volatility: Economic and political uncertainties as well as volatilities in different financial markets impact exchange rate and exchange market volatilities. This means that there are penetration into and influence on foreign exchange markets, of information and economic disturbances emanating from some other markets. Calvert et al (2006) got evidence of covariance towards the same direction, of exchange rate volatility and prices of gold and oil with a suggestion that these primary commodities are like proxies for worldwide economic risks.

Table 3.19: Nominal US Dollar Exchange Rate Percentage Changes in the WAMZ (2001-2015)

	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
2001	22.6	31.4	11.7	18.8	9.4	-5.1
2002	27.0	10.6	1.23	27.0	8.4	5.7
2003	43.2	9.4	0.4	-3.8	7.2	11.9
2004	5.26	3.8	13.0	-7.5	2.8	151
2005	-4.8	0.7	62.4	4.0	-1.2	7.0
2006	-1.8	1.1	41.3	1.6	-2.0	2.5
2007	-11.4	2.1	-18.5	5.6	-2.2	0.8
2008	-10.8	13.1	9.6	3.1	-5.8	-0.1
2009	20.1	33.2	4.3	8.0	25.6	13.6
2010	5.1	1.6	19.3	4.6	0.9	17.5
2011	5.2	5.6	16.3	1.1	2.4	9.3
2012	8.9	18.8	4.9	1.8	2.4	-0.1
2013	12.1	8.8	-1.1	5.5	-0.1	-0.3
2014	16.1	31.4	1.53	8.2	0.8	4.4
2015	22.7	10.6	6.7	2.7	21.4	12.3

Source: Author's Estimations and EViews 9.5 Output

The decline and dwindle in the prices of primary commodities over the last decade may have been the reason for continued depreciation in the currencies of these primary commodity

exporting WAMZ countries over same period as exhibited in Table 3.19 above showing percentage depreciation of the currencies of the WAMZ countries between 2001 and 2015. Although, The Gambia, Liberia and Nigeria' currencies experienced annual appreciation of currency one year or the other, around 2003 and 2007, the movements in the value of the WAMZ countries' currency during the global financial crisis period between 2008 and 2009 and thereafter reflect significant sharp depreciation, these confirmed that this stylised fact holds in the WAMZ.

3.5 Banking Sectors and Financial Systems of the WAMZ

In developing economies, the banking sector serves as the dominant sector and the most important link within the financial system. This is because bank financing is the most requested form of financing in countries within this category. WAMZ countries are bank-based are economies in which banking activites within retail banking thrive and spread over member countries.

Banking sectors of the WAMZ are small in size (absolutely and relatively), but account for a big share of assets and services of the financial sectors. Most banks exhibit low loan/deposit ratios while government securities is the greater proportion of banks' assets. These banking sectors are generally diverse, showing high rates of banking concentration and penetration, inefficiency, small size and low financial intermediation and are characterised by low competition, little barrier to entry and exits (causing the evident dominance of foreign banks), lowest access to finance (causing obstacles to business growth and curtailing the WAMZ's full economic growth potentials).

A large proportion of the WAMZ's population is unbanked, thereby making the access to credit by small and medium scale enterprises very tight. The nature of bank lending in the region is short term with over two-third of bank advances having maturity period of below

one year. Branches of banks are concentrated in few urban areas, yet there are high costs of banking operations as reflected in high fees and high interest rates spreads across banking sectors with the WAMZ. Lack of banking innovation, under-performances and inability to generate returns of scale are root causes of the lack of the capabilities of making banking environments healthy and competitive. These banking sectors settle for financial activities that are of low risks within a market displaying the niche for high profitability. This could not have serious impact on the finance of private sectors.

Another salient feature of the WAMZ's banking sectors is that banking systems within the monetary zone operate significantly excessive liquidity which implies the scarcity of creditworthy fund users. Further consequences of this factor for monetary policies in these countries is the effectiveness of policies in serving as instrument that could be applied in influencing bank lending, inflation and other monetary variables. The basic funding bases of banking systems in the WAMZ are domestic economies in which non-residents funding are negligible. Viewing this as a demand-side phenomenon, creditworthy borrowers constrain bank lending growth in the region.

Generally, the stylised feature of African banking systems are evident in the combination of some factors: (i) small absolute sizes of banks and the entire banking systems, (ii) low level of income, (iii) low financial literacy levels, (iv) large informal sectors, (v) infrastructural weaknesses, (vi) weak judicial enforcement mechanisms, (vii) weak contractual frameworks for banking activities weak, (viii) creditors' rights and political risks (Mlachila et al, 2013). However, across the WAMZ, there are significant variances in economic importance of banking as shown by differences in legal codes, laws and regulations, economic sizes, dependence on resources, public policies, history and population density.

Traditionally, banking sectors in the West Africa are dominated by banks having their roots in the UK and France due to the colonial control effects. Nowadays, banking sectors within the sub-continent are generally dominated by the combination of banks made up of domestic and pan-African banks.[82] Pan-African banks now account for increasing proportion of domestic banking in Africa. Nigeria has six of the seven largest banks in the Sub-Sahara Africa and this makes Nigeria's banking sector to be competitive, with the ability to offer substantial financial services. Nigeria banks (United Bank for Africa (UBA), GT Bank, Zenith Bank, Access Bank) now play dominant roles in the WAMZ member countries.

The banking sectors in the six WAMZ countries are predominantly made up of big domestic commercial banks, international banks' subsidiaries or branches (pan-African banks) and small banks (microfinance banks). Table 3.20 below dspalys the generic features of banking sectors across the WAMZ between 2011 and 2013 and the number of banks at the end of 2015. While Ghana has the highest number of commercial banks, he number of the bank branches in Nigeria is comparatively huge and enormous within the monetary zone.

Table 3.20: Some Structural Elements of Banking Sectors of the WAMZ (2011-2013)

	Total Number of Banks			***Number of Foreign Banks***			***Number of Bank Branches***		
	2011	***2012***	***2013***	***2011***	***2012***	***2013***	***2011***	***2012***	***2013***
Gambia	13	13	13	12	12	11	74	75	80
Ghana	25	26	27	14	14	15	814	862	892
Guinea	12	14	15	12	14	15	76	96	109
Liberia	8	9	9	8	8	8	78	79	82
Nigeria	20	21	22	4	4	4	5850	5050	5072
S/Leone	13	13	13	10	10	10	83	87	95

Number of Commercial Banks in the WAMZ Countries (as the end of 2015)					
Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
13	28	15	9	21	12

Source: Author's compilation and West African Monetary Institute

In assessing the stability of banking systems of the WAMZ, Bank Z Score of solvency and probability of default was considered in the cases of the six banking sectors in the zone. This evaluation yardstick, applied here, causes a banking sector to be unstable or fragile when its

[82] Pan-African banks are subsidiaries of foreign banks, but operating in many African countries.

Z score is below the threshold of 2.0 which is the mid-point between the extremes of the Altman Z Score Model's Grey Zone of Discrimination. Over the 20-year period of assessment, the six banking sectors within the WAMZ were stable, (except for Liberia and two cases for Ghana after the mid-90s) as highlighted in Table 3.21 below.

Table 3.21: Instances of Banking System Stability/Fragility in the WAMZ - Bank Solvency/Probability of Default

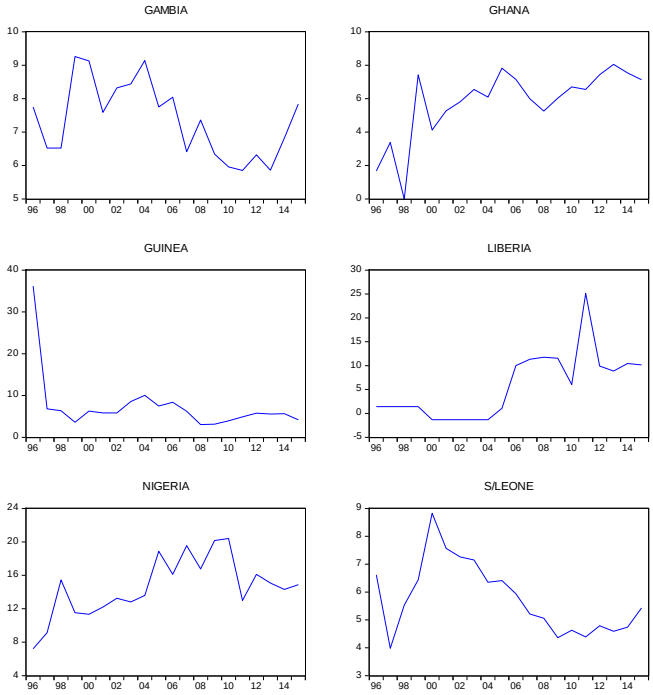
Dependent Variable: (Bank Z Score)						
Year	***Gambia***	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
1996	Stable	Fragile	Stable	Fragile	Stable	Stable
1997	Stable	Stable	Stable	Fragile	Stable	Stable
1998	Stable	Fragile	Stable	Fragile	Stable	Stable
1999	Stable	Stable	Stable	Fragile	Stable	Stable
2000	Stable	Stable	Stable	Fragile	Stable	Stable
2001	Stable	Stable	Stable	Fragile	Stable	Stable
2002	Stable	Stable	Stable	Fragile	Stable	Stable
2003	Stable	Stable	Stable	Fragile	Stable	Stable
2004	Stable	Stable	Stable	Fragile	Stable	Stable
2005	Stable	Stable	Stable	Fragile	Stable	Stable
2006	Stable	Stable	Stable	Stable	Stable	Stable
2007	Stable	Stable	Stable	Stable	Stable	Stable
2008	Stable	Stable	Stable	Stable	Stable	Stable
2009	Stable	Stable	Stable	Stable	Stable	Stable
2010	Stable	Stable	Stable	Stable	Stable	Stable
2011	Stable	Stable	Stable	Stable	Stable	Stable
2012	Stable	Stable	Stable	Stable	Stable	Stable
2013	Stable	Stable	Stable	Stable	Stable	Stable
2014	Stable	Stable	Stable	Stable	Stable	Stable
2015	Stable	Stable	Stable	Stable	Stable	Stable

Source: Author's estimations

Note: A banking system is defined as 'fragile' when its Z score is below the threshold of 2.0 (the mid-point between the extremes of the Altman Z Score Model's Grey Zone of Discrimination); and 'stable' if otherwise

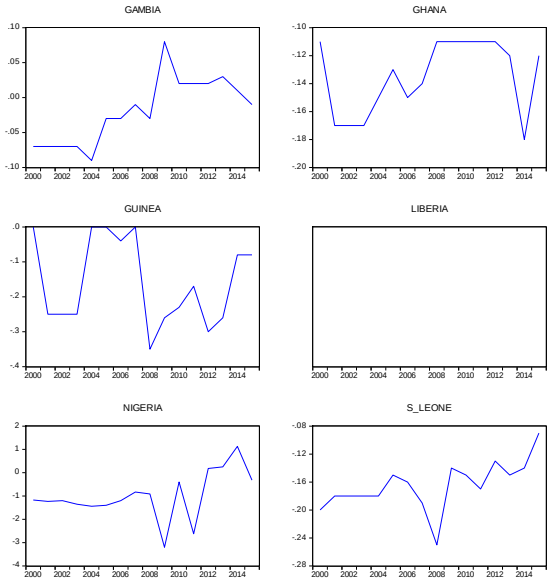
On the overall, these trends in the Z Scores signify positive implications for the confidence in the banking sectors of the proposed currency union. Trend in Z-Scores of the six banking systems in the WAMZ are revealed in Figure 3.5 below. Z-Scores reflected in these charts are weighted based on the WAMZ countries individual banks' total assets. It is apparent in the charts that from 2000, Sierra Leone displayed downward trend in banking system probability of default over the period cover by the analysis while other countries record up and down fluctuations in this respect.

Figure 3.5: Z-Scores of Banking the Systems in the WAMZ (1996-2015)



Source: World Bank Database and Eviews 9.5 Output

Figure 3.6: Boone Indicators of the Banking Systems in the WAMZ (2000-2015)



Source: World Bank Database and Eviews 9.5 Output

Trends in Boone indicators for the WAMZ countries between 2000 and 2015 are reflected in Figure 3.6 above. No information was reported for Liberia due to lack of data. The information in these charts indicate the various degrees of the WAMZ's banking markets competitions based on profit efficiency estimated as the elasticity of banks' profits to marginal costs. An increase in the Boone indicator indicates a deterioration of the competitive

conduct of financial intermediaries within the financial system. The rationale behind the indicator is that banks with high level of efficiency record higher profits. Therefore, the more negative the Boone indicator recorded by a WAMZ country's banking system, the higher the degree of competition, due to stronger effect of reallocation within the system. These charts generally reflect fluctuations over the period covered except for stable trend in the case of Ghana between 2007 and 2012.

Figure 3.7: Bank Capital/Assets Ratio of the Banking Systems in the WAMZ as at 2015

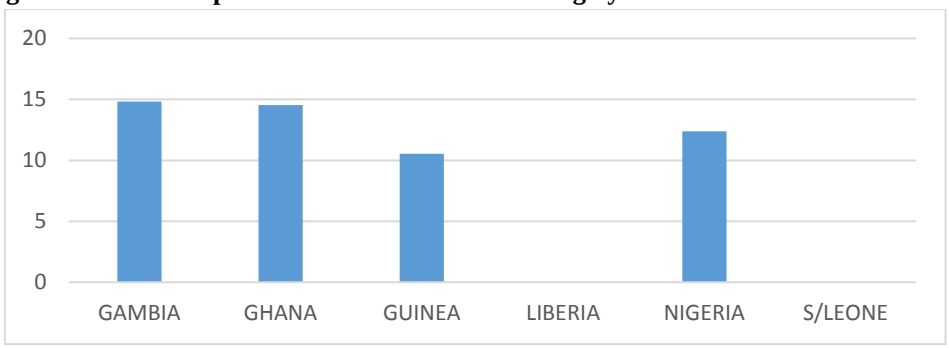


Figure 3.8: Non-Performing Loans/Total Loans Ratio of the Banking Systems in the WAMZ as at 2015

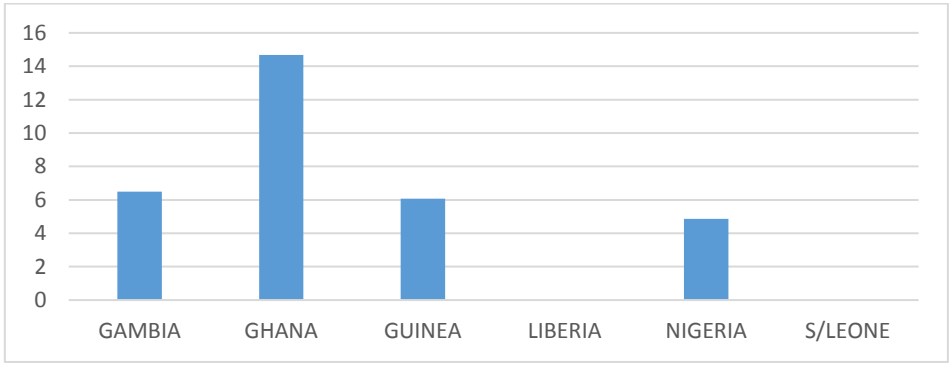
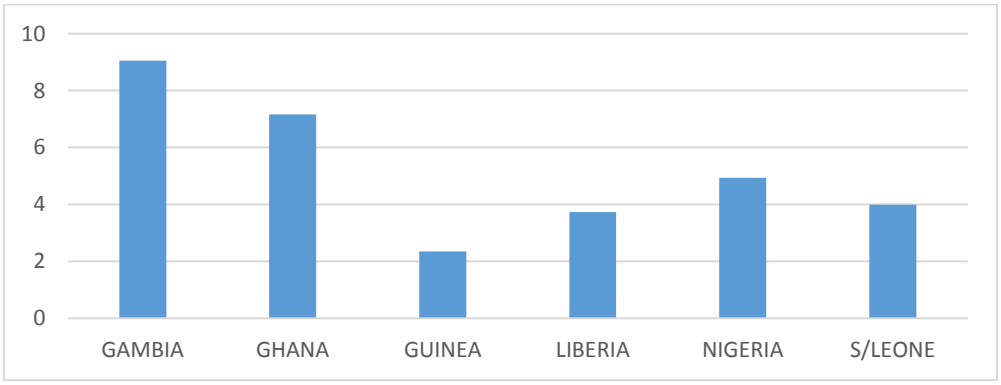


Figure 3.9: Commercial Banks Branches Per 100,000 Adults in the Banking Systems in the WAMZ as at 2015



Pictorial presentations of Capital/Assets Ratios, Non-Performing Loans/Gross Loans Ratios and Commercial Bank Branches per 100,000 Adults as the end of 2015 are as displayed in Figures 3.7 to 3.9 above to highlight comparative positions and status of banking systems in the WAMZ. Information on Liberia and Sierra Leone could not be reflected in the bank capital and non performing ratios charts due to the lack of data for these. Ghana had the highest non-performimg loan ratio while Guinea had the lowest spread of commercial bank branches over the country's population. Futher description of the banking sectors of the six WAMZ countries are provided in Appendix 3.6 of this research report.

3.6 Conclusions

This chapter evaluated some stylised facts and theoretical propositions in the cases of the WAMZ economies. Efforts were made to consider some popular macroeconomic empirical regularities and theories relating to international parity conditions (PPP, IFE and UIP), Phillips curves and Lucas output/inflation trade-off relationships as well as the relationships between domestic cyclical output and some macroeconomic variables in order to determine if there are supports for those stylised facts and theoretical conjectures and assumptions. Across the WAMZ and the selected developed economies (Germany, The UK and the US), the results yielded from this exercise were mixed in confirming or refuting the stylised facts evaluated. In spite of this, what was significantly achieved here was the exposure of the relevant nature and features of salient aspects of the economies of the WAMZ under monetary integration assessments. There are evidences here to draw conclusion that co-movements of cyclical components of macroeconomic series with real output as well as the fluctuations and variability of these macroeconomic variables follow similar patterns in the developing economies (of the WAMZ) and the developed economies sampled in this study. There were evidences that the theoretical propositions and assumptions of PPP (absolute and relative), IFE and UIP all failed to hold in the WAMZ. These have some negative

implications for the monetary models of exchange rate determination for the WAMZ economies. Other empirical finding also revealed that virtually all the stylised facts of exchange rates and exchange market behaviour got supports from the WAMZ countries. In addition to these, characteristics and performances of the banking sectors of the WAMZ (as proxy for the zone's financial systems) were highlighted, revealing stability of the banking sectors of the WAMZ countries over the 20-year period covered by the study.

Chapter 4

Optimum Currency Area Empirics Perspectives

4.1 Background

Investigations based on the Optimum Currency Area (OCA) theory would always point towards answering questions bothering on common characteristics that have to be shared by countries aiming at forming a monetary union. A conclusion of the OCA theory is that if independent monetary policies for countries within a geographic area is to be necessary, it would be consequent upon meeting some certain conditions. Monetary policy and exchange rate policy are macroeconomic tools that can alleviate asymmetries in shocks which are specific to a country. If there are similarities in shocks hitting a country and some other countries within an area, then, there may not be the need to implement different monetary policies (in this case, a common monetary policy will suffice). Based on this, there may be justification for the formation of a monetary union between these countries. However, on the contrary, the more asymmetric the economic shocks, the less efficient and effective the stabilisation mechanism (that serves as an alternative) and accordingly, the more costly the participation of the countries in such monetary integration.

Right from the early 1960s when the theory of optimum currency area came to limelight, several authors, through their various seminal contributions have been able to come up with various properties of an OCA. Most of these properties, which many regarded as prerequisites, features attributes or criteria of an OCA are summarised in the Table 4.1 below:

Table 4.1: Properties/Criteria of an Optimum Currency Area and Implications

Properties/Criteria	Implications
Flexibility of Nominal Wages and Price ***(Friedman, 1963)***	• Flexibility of wages and prices within/between members of a common currency area will make asymmetric shocks to be overcome easily because the movement adjusting for the shocks will not be linked with inflation in one country and/or sustained unemployment in another and thus bringing in higher degree of stability in the common currency area
Mobility of Factors of Production - Including labour ***(Mundell, 1961)***	• There will be reduction in the need to alter real factor prices and nominal exchange rate between member countries when responding to disturbances, if factors of production are mobile within the common currency area, even if factor costs are rigid. • It will be more difficult to maintain a fixed exchange rate regime when the capital mobility is higher. • Simply put, adjustments to asymmetric shock are facilitated and the pressures for adjustments in exchange rates are reduced when the degree of labour mobility is high.
Degree Openness of the Economy ***(McKinnon, 1963)***	• The higher the degree of economic openness of a member country of a common currency area, the more the likelihood of the transmission of the changes in international prices of tradables to domestic prices. • If the higher share of domestic outputs of a country are generated from trades within the common currency area, such country will benefit from membership of the currency union.
Size of the Economy ***(McKinnon, 1963)***	• Large economies have the tendencies to be attracted by the flexible exchange rate regime implying that medium or small-sized countries find fixed exchange rate regime (as desired by monetary union) attractive.
Diversification of Production, Exports and Consumption ***(Kenen, 1969)***	• The higher the diversification of production and consumption by member countries of a currency union, the more likely the reduction in costs due from discarding nominal exchange rate changes between these countries, thus finding a common currency as valuable. • The impact of shocks that are specific to a particular sector of the economy would be diluted by high level of diversification in production and consumption. • Consequently, diversification shields economy against series of disturbances and causes reduction in the needs for changes in terms of trade through nominal exchange rate.
	• It is more difficult to maintain a fixed exchange rate regime in situations of inflation rate differentials between member countries of a common currency area.

Similarities in Inflation or Differences in Inflation *(Flemming, 1971)*	• External imbalances can crop up due to continuous differences in inflation rates of nations within the common currency area. • Terms of trade will remain fairly stable when Inflation rates between countries are similar over time and at the same time low.
Fiscal Integration (*Kenen, 1969, De Bandt & Mongelli, 2000)*	• When countries share supranational fiscal transfer system in redistributing funds to those member countries that are affected by adverse asymmetric shocks, such countries would also have smooth adjustments to such negative shocks and would require reduced adjustments in nominal exchange rate. • This fiscal integration requires the needs to share the risks involved and necessitates a high level of political integration. • Asymmetric shocks are counteracted through fiscal transfers – (When there are shocks, affecting particular member countries within a common currency area in different ways, fiscal transfers from prosperous member countries to non-prosperous member countries would counteract the effects of the shocks). • High degree of policy integration leads to low inflation.
Political Integration (*Mintz 1970; Harberler, 1970; and Cohen, 1993)*	• Several authors see economic integration to be so far in front of political integration. • The political determination of countries to integrate is a significant condition for sharing a common currency. • Cooperation on common economic matters, adherence to joint commitments, and more international linkage will all be strengthened and enhanced by political will of member nations within the common currency area. • In transforming a group of nations to a successful common currency area, it essential that there is similarity of attitudes to politics and policies among member countries of the common currency area.
Financial Market Integration *(Ingram, 1969)*	• The higher the level of financial integration, the greater the extent of the need to establish an optimum currency area across geographical blocs. • The need for exchange rate adjustments can be reduced by financial market integration. • Through capital market inflows, temporary adverse disturbances can be cushioned. • With financial market integration, there will be reduction in the need to change inter-regional or intra currency area terms of trade through fluctuations in exchange rate. • For the sustainability of a successful common currency area, tight financial market integration is essential.

	•
**Similarities of Shocks and Similarities in Policy Responses to the Shocks (*Bayoumi & Eichengreen, 1996; Masson &Taylor, 1993; Demertizis, Hughes &Rummel, 2000; Alesina, Barro & Tenreyro, 2002.*	• If member countries of an optimum currency area record similarities in demand and supply shocks and the speed of at which their respective economy adjust as well as the speed of policy responses, there will be loss of monetary policy autonomy and fall in the cost of loss of direct control over the nominal exchange rate. • Member countries of an optimum currency area showing large co-movements of output and prices would incur the lowest cost of dumping monetary independence vis-a-vis other member countries. • This implying that the higher the similarities in shocks between members of a common currency area, the lower the costs of losing independence monetary policy.
Similarities in Monetary Policy Transmission *(Angeloni, Kashyap, Mojon and Terlizzese, 2001)*	• Similarities in monetary transmission mechanism among member countries of an optimum currency area speak volume about the similarities in financial structures of these countries.
External Nominal Shocks	• Fixed exchange rate regime will not be attractive to a potential member of an optimum currency area, if such country faces external nominal shocks. A flexible exchange rate system would be more appropriate.
Monetary Shocks	• Fixed exchange rate regime will be more attractive to a potential member of an optimum currency area, if such country faces monetary shocks. A flexible exchange rate system would not be attractive.
Real Shocks	• Fixed exchange rate regime will not be attractive to a potential member of an optimum currency area if such country faces real shocks. A flexible exchange rate system would be more appropriate.
Business Cycle Synchronisation	• Flexible exchange rate regime will not be appropriate if the group of countries forming an optimum currency area has synchronised business cycle.
Central Bank's Credibility	• If the central banks of the prospective member of a common currency area lack the credibility to moderate inflation, fixed exchange rate regime would be more advantageous, rather than flexible exchange rate.
Monetary Policy Effectiveness	• For a prospective member of a common currency area, the cost of monetary independence is low (and not a high cost) such country's monetary policy is ineffective.

Sources: Author's compilations

It is apparent that the theory of OCA points to two major directions in the assessment of the economic usefulness of the existence of an OCA. In the first direction, the assessment can

focus on whether the asymmetries that exist between different countries are substantial and sizeable enough to justify and validate the use of both independent monetary policy and alternative alleviation mechanisms. In the other direction, the assessment could be in the form of examining whether independent monetary policy and floating exchange rate policy can be applied in isolating the effects of external disturbances from the economy. A collection of countries will form an OCA if conclusions derived can show that independent monetary policy as well as the isolation of external shocks through floating exchange rate policy are unnecessary. In this case, the formation of a monetary union between the countries will not be characterised and hampered by any substantial macroeconomic disturbances. Coming from the theoretical background of an optimum currency area (OCA), this chapter empirically evaluated seven (7) OCA properties towards gathering evidences in determining the extent to which the WAMZ constitutes an OCA. These properties are: (i) macroeconomic dynamics and uniformity in macroeconomic performances; (ii) synchronicity of business cycles; (iii) homogeneity of inflation patterns; (iv) similarities of production structure; (v) degree of trade and investment openness; (vi) financial integration and financial systems convergence; and (vii) factor market flexibilities.

Consequently, going by the various underlying theoretical propositions of the OCA, the research objective of the chapter was to investigate if there are synchronicity, uniformity similarities and homogeneities in the properties of the OCA across the WAMZ. Specifically, this chapter was meant to provide convincing answers to the following research questions: (i) are trends in macroeconomic performance of the WAMZ countries homogeneous? (ii) what is the degree of symmetry of economic dynamics of the WAMZ countries? (iii) are business cycles across the WAMZ well synchronised? (d) are the properties and patterns of inflation and inflationary behaviours in the WAMZ uniform? (iv) how similar are the production structure of the WAMZ countries? (v) how open are the WAMZ countries in terms of trade

and investments? What are the degrees of bilateral trade intensities in the WAMZ? (vi) are there financial systems convergence in the WAMZ? What is the magnitude of financial systems integration in the WAMZ? (vii) what are the degrees of factor market flexibilities across the WAMZ? Are labour markets in the WAMZ flexible? Answers to these research questions produced various evidences in assisting to draw useful inferences in making relevant suggestions about the feasibility of monetary integration of the WAMZ.

4.2 Macroeconomic Indicators and Dynamics

Evidence of potential problem and possible costs of single monetary and exchange rate policy could be gathered from the study of the uniformity of macroeconomic policies and performances, the level of economic development of a monetary union's member economies as well as the patterns of economic dynamics within the WAMZ. Economic and monetary integration of countries should be easier if there are similarities in past economic performances and development. While policy preference of a country is a reflection of past economic policies, the level of economic development is depicted by developments in macroeconomic and financial structures. The case for, and the essence of monetary autonomy would be reduced if there are similarities in economic priorities of countries involved in such monetary integration. The more the degree of uniformity or homogeneity of the economic performances of a monetary union's member countries, the more it would be easy for stability of the single currency of the union whenever the union is faced with economic shock.

In the OCA theory, a popular criterion is the symmetry of economic dynamics as established by classical and contemporary theorists. It is vital to incorporate the homogeneity of economic dynamics into the OCA related assessment of monetary integration of the WAMZ. If there are structural differences in growth, these potentially point to stabilisation costs of

monetary integration. When a group of countries adopt a single currency and/or a common monetary policy, these countries relinquish the opportunity to adjust their monetary conditions according to the desires of economic monetary policy. In a monetary union, this 'lost opportunities' are of greater value, the higher the degree of difference in output. For instance, the more economic growth and marginal return on capital are heterogeneous across a monetary union, the more a common central bank would have problems in setting the real interest rate in order to deal with various degrees of growth in money and credit. In many respects, it is usual that there will always be differences in economic dynamics of prospective members of a (proposed) monetary union. Such differences may be in average growth rate, amplitudes and timing of fluctuations. In this study, the evaluation of economic dynamics of the WAMZ here was based on empirical analyses of growth differences in the WAMZ by giving an overall measure of economic dynamics through the estimation that generates growth inequality coefficients for these countries. Consequent upon these, this section investigated the uniformity of some relevant macroeconomic indicators of the WAMZ countries and assessed the macroeconomic dynamics with the monetary zone.

Data and Methods: In the first aspect, the assessment of the degree of similarities in the behaviours of macroeconomic indicators of the WAMZ countries was carried out through the analysis of variance (ANOVA) tests. The result of this test would be employed to determine if the economic variables being assessed are similar among the monetary union members. In this sub-section, macroeconomic variables of output growth, output gaps, inflation (GDP deflator and consumer price index), nominal exchange rate and fiscal policy ratios of budget balance/GDP, government expenditure/GDP and government revenue/GDP) were analysed. Relevant data employed here span between 1980 and 2014.

The test of output growth and output gaps investigated if there is a wide growth rate variation or similarities in the deviation of real output from its potential levels within the WAMZ,

given the theoretical short run difficulty in stabilising economic growth. Regarding inflation, if there is any significance difference within the WAMZ countries, it would be difficult for the single currency to function effectively due to the contradictory effect of applying the necessary macroeconomic policies across the six economies by the single monetary authority. On the various exchange rate ANOVA tests, it is the wish of the WAMZ to have a single currency that would be able to trade at par with other world's strong convertible currencies, particularly, the US dollar. This may be difficult to achieve if there is a wide variance in the WAMZ's member s' US dollar exchange rate as this may portend high possibility of significant future fluctuation between the proposed single currency and the US dollar taking cognisance of inflation trends. Further to the consideration of the monetary elements, the synchronisation of money supply/GDP ratios, money supply growth rates, real interest rates and real effective exchange rates were also evaluated. Fiscal harmony is indispensable towards establishing a fiscal union which is very crucial for a successful monetary union. Therefore, to test for the presence of fiscal harmony within the WAMZ, the variability in the six fiscal ratios were investigated. In addition to these, homogeneities in balance of payment accounts and external trade ratios were assessed by applying current account/GDP, total balance/GDP, income balance/GDP, imports-exports/GDP, inflow of foreign direct investment/GDP and international reserves/GDP ratios.

The ANOVA tests carried out here show the statistical significance of the differences (or otherwise) in a variable of member countries being analysed. The statistical assumptions in an ANOVA test are independence of errors, normality and equality of variance. The one-way ANOVA is appropriate in a statistical model in which no restriction are imposed on means of the population group and the outcomes for each group in the analysis are normally distributed displaying common variances while it is assumed that the deviations of these individual outcomes from the means of the population group are independent. Generally, the null

hypothesis for an ANOVA test is a 'point hypothesis' which states that 'there is nothing interesting happening'. In a one-way ANOVA test, the null hypothesis with j group is:

$H_0 = \mu_1 = \mu_2 = \ldots\ldots\ldots \mu_j$

The alternative hypothesis is:

$H_A = \mu_1 \neq \mu_2 \neq \ldots\ldots\ldots \mu_j$

Where:

μ = the population mean.

Specifically for this analysis, the null hypothesis is:

$H_0 = The\ Gambia = Ghana = Guinea = Liberia = Nigeria = Sierra\ Leone$

and the alternative hypothesis is:

$H_A = The\ Gambia \neq Ghana \neq Guinea \neq Liberia \neq Nigeria \neq Sierra\ Leone$

The null hypothesis was that the mean of the macroeconomic variables and fiscal ratios in the six WAMZ countries are equal. For the analysed variables/ratios, at 95% level of confidence, the rule here is that if the p-value obtained from the test should be less than the 5% level of significance, the difference in the variable/ratio among the WAMZ countries is statistically significance and so, we reject the null hypothesis.

Further attempt made here is the estimation of economic dynamics across the WAMZ by shrinking these dynamics into a single indicator of Theil Coefficient of Inequality which compares the differences in growth in each member country as well as growth in: (a) the entire WAMZ economies; (ii) the WAMZ economies (without the lead economy, Nigeria); and (iii) the lead economy of Nigeria. Generally, Theil coefficient of inequality relates to economic growth convergence and it measures inequality within regions rather than equality among individuals within a region. Specifically, the application of Theil coefficient allowed for the comparison of the WAMZ economic dynamics. Data on economic growth of the six WAMZ countries, spanning between 1987 and 2015 were applied in these estimates.

Theil (1967) developed two popularly employed measures of inequality which satisfy all the ideal and standard properties of an inequality measure. Theil 1 statistics ($U1$) adapted from Theil (1958) is expressed as:

$$U1 = \left(\frac{\sqrt{\frac{1}{N}.\sum_{t=1}^{N}(y_{it}-x_t)^2}}{\sqrt{\frac{1}{N}\sum_{t=1}^{N} y_{it}^2}+\sqrt{\frac{1}{N}\sum_{t-1}^{N} x_t^2}} \right) \quad 4.1$$

Theil 2 statistics ($U2$) adapted from Theil (1966) is given as:

$$U2 = \left(\frac{\left[\sum_{t=1}^{N}(x_t-y_{it})^2\right]^{\frac{1}{2}}}{\sum_{t=1}^{N}(y_{it}^2)} \right) \quad 4.2$$

where y_{it} is the economic growth of WAMZ country i and x_t is the economic growth of the WAMZ (as well as economic growth of WAMZ without Nigeria and economic growth of Nigeria). N is the number of observations. The values of Theil 1 ($U1$) of lie between zero (0) and unity (1). It is assumed that at the minimum value of zero, there is perfectly fit complete equality. If at the extreme of the value of 1, there is no fit, thus depicting complete inequality. For Theil 2 ($U2$), though there is also lower boundary of zero as in Theil 1($U1$), but there is no definite upper boundary. The minimum value of zero is also a perfect fit. Values yielded by $U1$ and $U2$ are not expected to be same. By implications, maxima inequality is achieved at the upper boundaries.

Theil measures have several properties that make them to be superior measures of inequality.[83] Two conveniences derivable from Theil coefficient of inequality are that: (a) within the broad inequality concept, they give rooms for the comparison of pairs of economic variables at different scales. Particularly in this study, this enables the measurement of how

83 Theil statistics are symmetric, replication invariant, mean independent and satisfies the Pigou-Dalton property and they are Lorenz-consistent.

individual WAMZ countries glaringly behaved differently from the monetary zone's average; (b) it allow time series inequality to be decomposed into main statistical factors (mean difference, variation differences and covariance (correlation) differences). Consequently, in describing the difference between two variables by statistical properties, inequality can be decomposed into three factors: (i) mean proportion (MP); (ii) variance proportion (VP); and (iii) covariance proportion (CP). These three properties must add up to be unity (1). MP shows the sample mean difference between the two variables involved. A large element is an evidence to suggest that the inequality stems from different scales of the two series. VP reveals the sample deviation from actual and forecast. A large VP implies that higher variability of one variable (than the other) explains much proportion of the inequality. When the CP is large, it indicates that the correlation coefficient between the two variables is small; and this measures trend differences and the degree of absence of fluctuation synchrony around trend because it reveals the effect biases in mean biases and variance biases. These three components of inequality can be derived mathematically as:

$$MP = \left(\frac{(\bar{y} - \bar{x})^2}{\frac{1}{N} . \sum_{t=1}^{N} (y_{it} - x_t)^2} \right) \quad 4.3$$

where $\bar{y}$ is $\frac{1}{N} . \sum_{t=1}^{N} y_{it}$ and $\bar{x}$ is $\frac{1}{N} . \sum_{t=1}^{N} x_t$

$$VP = \left(\frac{(\sigma_{y,N} - \sigma_{x,N})^2}{\frac{1}{N} . \sum_{t=1}^{N} (y_{it} - x_t)^2} \right) \quad 4.4$$

where $\sigma_{y,N}$ is $\sqrt{\frac{1}{N} . \sum_{t=1}^{N} (y - \bar{y})^2}$

and $\sigma_{x,N}$ is $\sqrt{\frac{1}{N} . \sum_{t=1}^{N} (x - \bar{x})^2}$

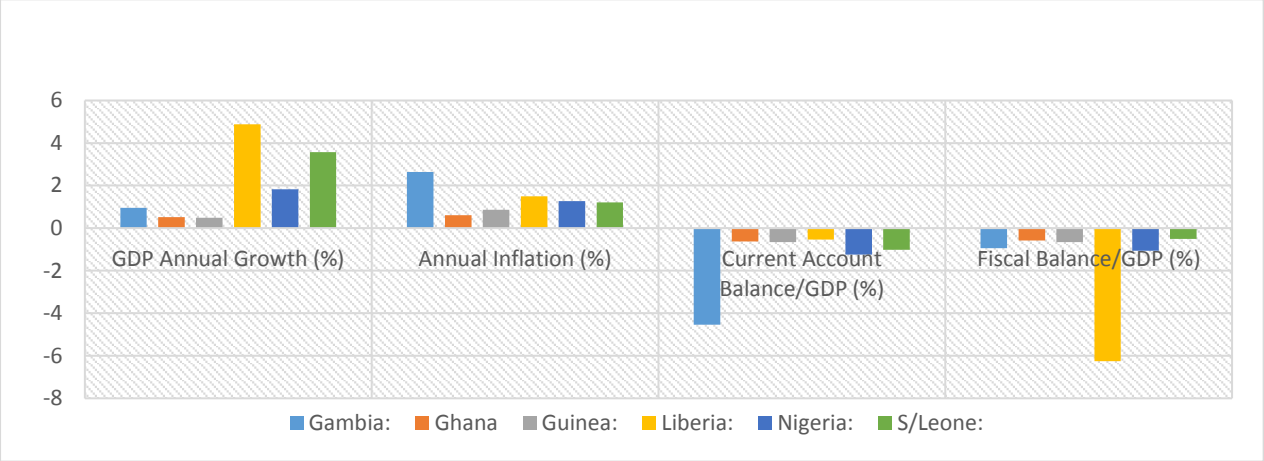
$$CP = \left(\frac{2.(1 - \rho_N) . \sigma_{y,N} . \sigma_{x,N}}{\frac{1}{N} . \sum_{t=1}^{N} (y_{it} - x_t)^2} \right) \quad 4.5$$

where ρ_N is $\left[\left(\frac{1}{(\sigma_{y,N}).(\sigma_{x,N})}\right).\sum_{t-1}^{N}(y_t-\bar{y}).(x_t-\bar{x})\right]$

and $MP + VP + CP = 1$.

Results and Findings: Information on the dispersion of four macroeconomic indicators of the WAMZ countries are exhibited in Figure 4.1 below. This reveals the pattern of coefficients of variation of output growth, inflation, current account balance/GDP and fiscal balance/GDP ratios over a 35-year period between 1980 and 2014.

Figure 4.1: Plot of Coefficients of Variation of Historical Macroeconomic Performances of WAMZ Countries (1980-2014)



Source: EIU Database and Author's Estimations
Note: Liberia's estimations for GDP annual growth and fiscal balance start from 1994 and 2007 respectively.

Generally, GDP growth and inflation revealed dissimilar patterns as Liberia, Sierra Leone and Ghana standing out clearly. Current account and fiscal balance (both as ratios of GDP) show some close similarities across the WAMZ apart from the case of The Gambia (in current account ratio) and Liberia in fiscal balance ratio. The results of the one-way ANOVA test are presented in the Table 4.1 below which shows clearly that output gaps and growth rates of real GDP and money supply (M1 and M2) displaed uniformity among the WAMZ countries implying that it may not be difficult for the zone's money supply growth and economic growth to be stabilised the short run. The uniformity in money supply (M1) growth rate is an indication that common monetary policy with money supply as instrument will not be inappropriate for the WAMZ. The results for inflation rates indicated that if the single

monetary authority would want to moderate inflation within the single currency area, the policy objective may not be achieved due to the contradictory effects that may result. The suggestion from the analysis of the nominal dollar exchange rates was that it would be difficult to avoid the possibility of future fluctuations between the US dollar and the WAMZ's proposed single currency which may be unable to compete at par with the US dollar.

Table: 4.2: Results of ANOVA Tests of Uniformity of Economic Variables/Ratios of WAMZ Countries

Variables/Ratios	*p-value*	*F-ratio*	*Critical value*	*Decision*	*Uniformity of Variable/Ratio*
Real GDP Growth Rate	0.12	1.82	2.34	H_0 accepted	***YES***
Output gap	0.99	0.002	2.32	H_0 accepted	***YES***
Inflation (GDP Deflator)	0.00	3.64	2.34	H_0 rejected	***NO***
Inflation (CPI)	0.00	5.63	2.34	H_0 rejected	***NO***
Nominal Dollar Exchange Rate	1.74E-24	60.87	2.34	H_0 rejected	***NO***
Real Effective Exchange Rates*	5.37E-16	38.73	2.52	H_0 rejected	***NO***
Real Interest Rates	0.003	3.97	2.34	H_0 rejected	***NO***
Money Supply (M2)/GDP Ratio	2.48E-08	11.82	2.34	H_0 accepted	***YES***
Money Supply (M1) Growth	0.39	1.05	2.34	H_0 accepted	***YES***
Money Supply (M2) Growth	0.39	1.05	2.34	H_0 rejected	***NO***
Budget Balance/GDP	2.68E-06	8.40	2.34	H_0 rejected	***NO***
Primary Balance/GDP	1.46E-06	8.81	2.34	H_0 rejected	***NO***
Public Debt/GDP	6.63E-13	21.04	2.34	H_0 rejected	***NO***
Debt/Export Ratio	2.37E-05	7.12	2.35	H_0 rejected	***NO***
International Reserves/Debt	1.62E-09	13.93	2.34	H_0 rejected	***NO***
Govt. Expenditure/GDP	6.88E-07	9.34	2.34	H_0 rejected	***NO***
Government Revenue/GDP	0.00	4.12	2.34	H_0 rejected	***NO***
Current Account Balance/GDP	4.56E-16	29.2	2.34	H_0 rejected	***NO***
Income Balance/GDP	0.00	5.11	2.34	H_0 rejected	***NO***
Total Balance/GDP	7.27E-15	25.91	2.34	H_0 rejected	***NO***
Imports/Exports	3.71E-25	69.46	2.35	H_0 rejected	***NO***
Inflow FDI/GDP *	0.14	1.82	2.52	H_0 rejected	***NO***

Source: Author's calculation and the EIU database

* Due to lack of data, estimations were made leaving out Liberia.

The fiscal ratios undoubtedly exhibited lack of fiscal harmony within the WAMZ and this is a cause for concerns so as to avoid possible sovereign debt problems just as none of the external trade/balance of payments ratios show uniformity.

Out of the twenty two variable/ratios assessed in the ANOVA tests, only four exhibited homogeneous characteristics. There were significant differences in the other eighteen variables/ratios examined. This indicates that WAMZ countries have individual economic characteristics that are different from each other. These heterogeneities signify that a policy meant to solve the problem of WAMZ country many have a transmittal effect that may cause other member countries within the zone to experience a consequential secondary effect that may be hugely negative. On the overall, although, variables relating to money supply and output are positive, other indicators have negative implications for the monetary integration of the WAMZ.

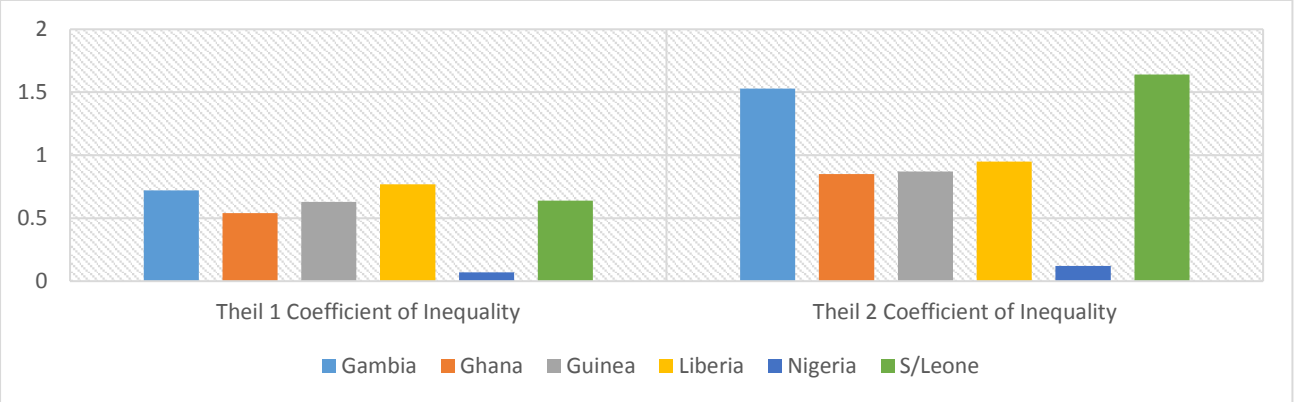
The results of economic dynamics estimations of Theil 1 and Theil 2 coefficients of inequality as well as the variance and covariance proportions for the three benchmarks indicated in this study are displayed in Table 4.3 while the related plots are in Figures 4.2 to 4.7 below. The comparison of economic growth in the six WAMZ countries with the aggregate WAMZ's economic growth over the 28-year period covered by the estimations are highlighted in Table 4.3. Nigeria, the lead economy shows the lowest coefficients of inequality in both Theil 1 and estimations. Sierra Leone and The Gambia displayed the highest inequality with the WAMZ's aggregate in Theil 2 results as revealed in pictorial representation in Figure 4.2 below. The rates of inequality of the other five WAMZ countries in Theil 1 estimation results reveal close similarities with Ghana yielding the lowest of all.

Table 4.3: Theil Coefficient of Inequality on Nominal GDP Growth for WAMZ Countries (1987-2015)

Nominal GDP Growth Relative to WAMZ Average				
	Theil 1 Coefficient	***Variance Proportion***	***Covariance Proportion***	***Theil 2 Coefficient***
Gambia	0.72	0.85	0.15	1.53
Ghana	0.54	0.39	0.61	0.85
Guinea	0.63	0.92	0.08	0.87
Liberia	0.77	0.86	0.14	0.95
Nigeria	0.07	0.01	0.99	0.12
S/Leone	0.64	0.93	0.07	1.64
Nominal GDP Growth Relative to WAMZ Average (Excluding Nigeria)				
	Theil 1 Coefficient	***Variance Proportion***	***Covariance Proportion***	***Theil 2 Coefficient***
Gambia	0.69	0.70	0.30	1.33
Ghana	0.11	0.02	0.98	0.63
Guinea	0.57	0.52	0.48	0.79
Liberia	0.78	0.93	0.07	0.96
S/Leone	0.60	0.61	0.39	1.03
Nominal GDP Growth Relative to Nigerian Average				
	Theil 1 Coefficient	***Variance Proportion***	***Covariance Proportion***	***Theil 2 Coefficient***
Gambia	0.71	0.78	0.22	1.54
Ghana	0.59	0.51	0.49	0.82
Guinea	0.64	1.00	0.00	0.87
Liberia	0.77	0.89	0.13	0.95
S/Leone	0.63	0.84	0.16	1.58

Source: Author's calculation and the EIU database

Figure 4.2: Theil 1 Coefficients of Inequality for Output Growth Relative to WAMZ Average

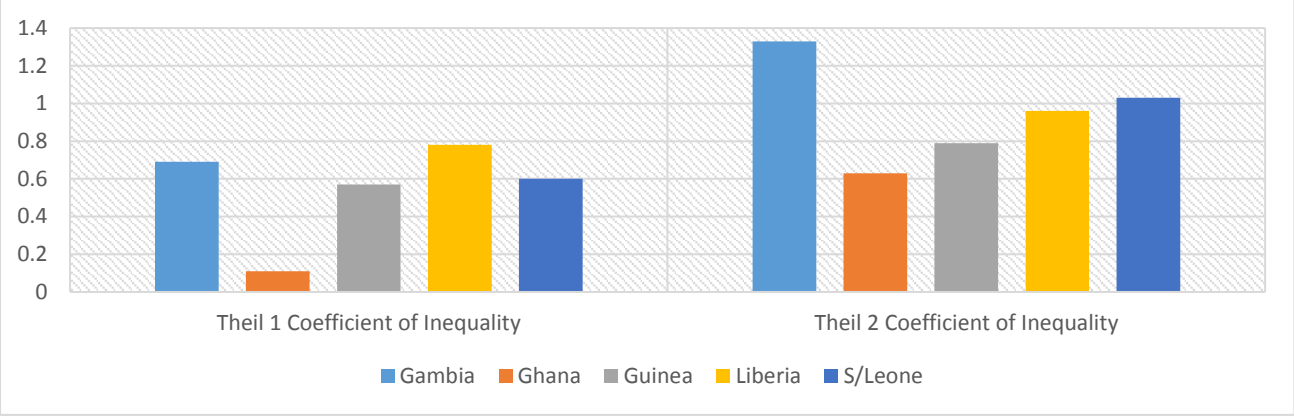


Source: Author's calculation and the EIU database

When the equality of economic dynamics in the WAMZ without Nigeria was estimated, Ghana returned the lowest degree of inequality in both Theil coefficient estimations as highlighted in Figure 4.3 below. However, these degrees of inequality were more pronounced

in Theil 2 coefficient results. When the WAMZ's lead economy, Nigeria was served as the benchmark for the other five countries within the zone, the levels of inequality were high as reflected in the output of both Theil measures of inequality, but more similar in Theil 1 estimation results where Ghana recorded the lowest of the degrees of inequality as Figure 4.4 below shows. These denote that patterns of economic dynamics in the five other WAMZ countries are not same as in the case of the lead economy, Nigeria, thus justifying the results generated in the estimations in which the aggregate WAMZ economy was the reference.

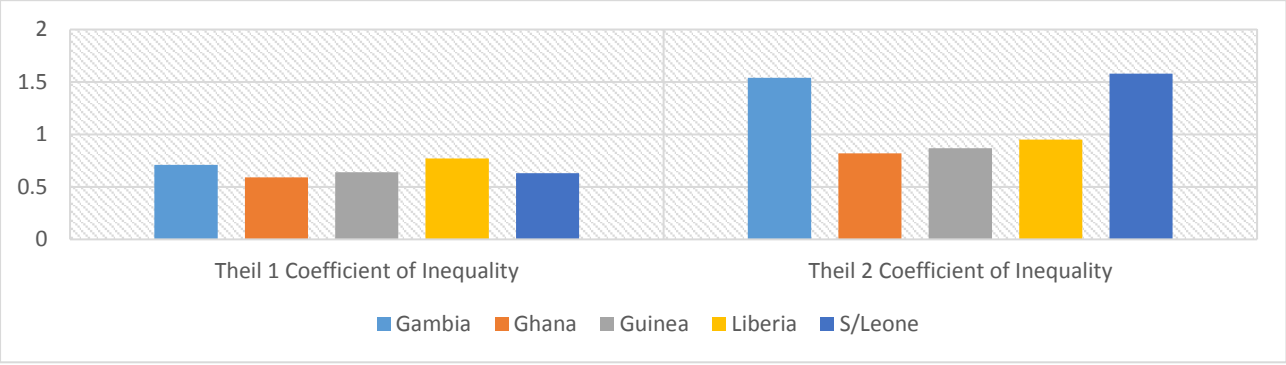
Figure 4.3: Theil Coefficients of Inequality for Output Growth Relative to WAMZ Average (without Nigeria)



Source: Author's calculation and the EIU database

The overall implication of these results is that the economy of WAMZ revolves around a single country, Nigeria.

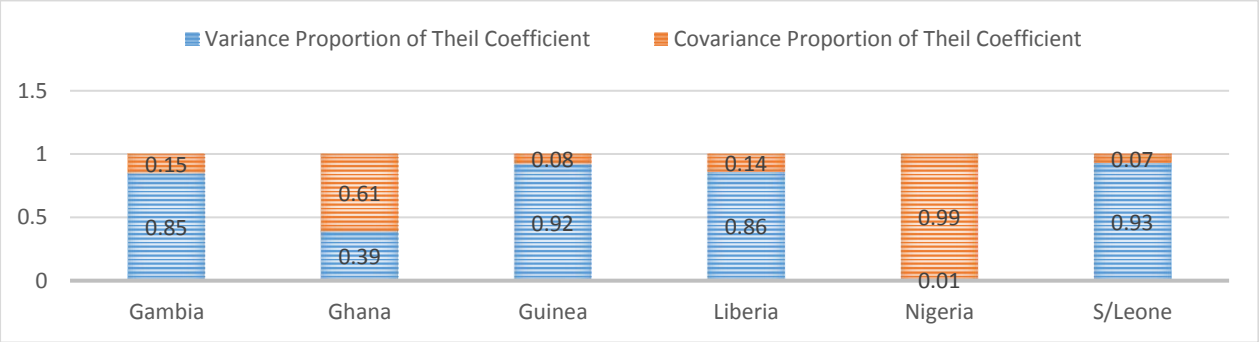
Figure 4.4: Theil Coefficients of Inequality for Output Growth Relative to the Lead Economy - Nigeria



Source: Author's calculation and the EIU database

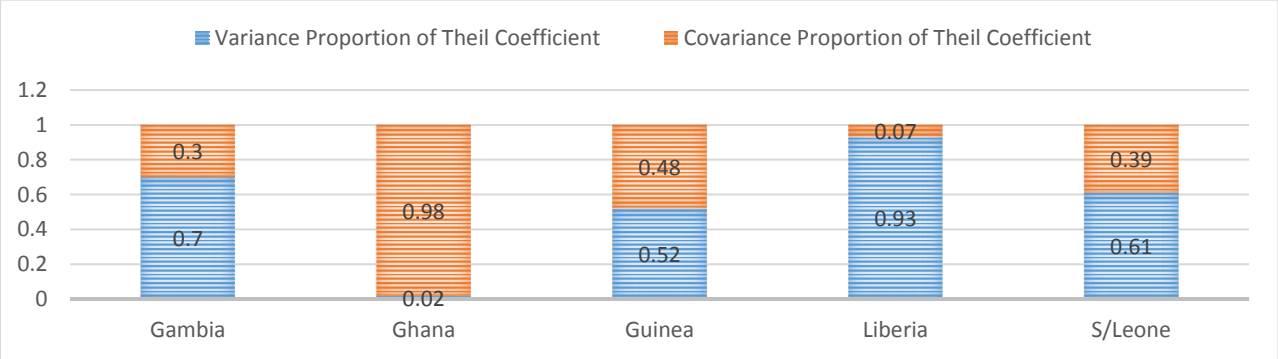
The statistical components of the dynamics of economic growth estimated under the three benchmarks are exhibited in Figures 4.5, 4.6 and 4.7 below. Because the WAMZ countries were fully evaluated against these over the estimation period, the mean proportion (MP) in all estimation is zero, while the variance proportion (VP) and the covariance proportion (VP) yielded values that added up to unity. These results reflect the relationship of the inequality to different variance and lack of covariance.

Figure 4.5: Components of Theil 1 Coefficients of Inequality for Output Growth Relative to WAMZ Average



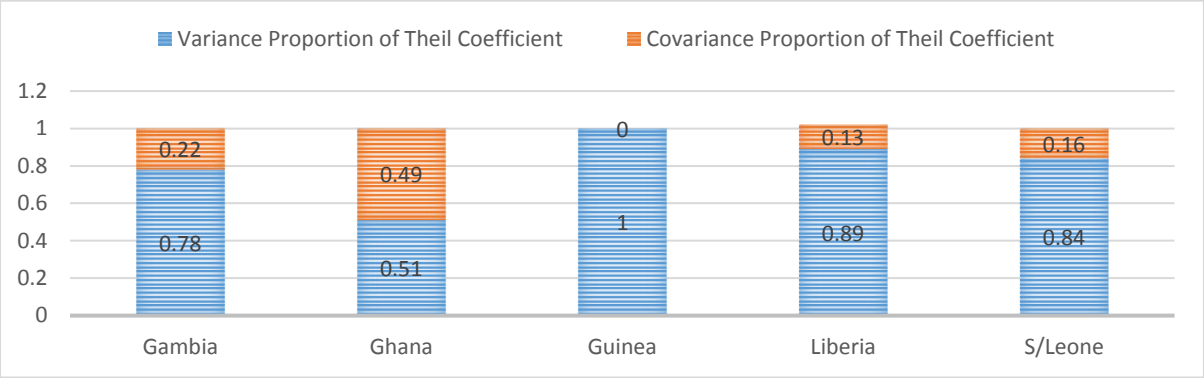
Source: Author's calculation and the EIU database

Figure 4.6: Components of Theil 1 Coefficients of Inequality for Output Growth Relative to WAMZ Average (excluding Nigeria)



Source: Author's calculation and the EIU database

Figure 4.7: Components of Theil 1 Coefficients of Inequality for Output Growth Relative to Nigerian Average



Source: Author's calculation and the EIU database

Figure 4.5 above reveals that Nigeria has a very high variability of economic growth at 0.99 with the WAMZ aggregate economy. Apart from Ghana, other WAMZ countries reported low variability. Nigeria has the lowest level of lack of synchrony (0.01) of fluctuations around trend when the WAMZ was the benchmark; and this implies strong correlation between Nigeria and the WAMZ aggregate economy. The analysis of the WAMZ economy without Nigeria revealed Ghana as having the highest level of variability at 0.98 if Nigeria would not be part of the WAMZ economy as well as having the highest degree of correlation with such economy as shown in Figure 4.6 above. The results of the inequality of growth estimations in relation to the Nigeria's economy are displayed in Figure 4.7. This reveals that Guinea has the lowest variability of economic growth with Nigeria (the lead economy) and the highest lack of synchrony around trend with the Nigeria's economy. Ghana recorded the highest variability of economic growth with Nigeria at 0.49. The patterns of the dynamics of these five WAMZ economies are not close to that of the lead economy, Nigeria. This has serious implications for a future common monetary policy formulation and implementation in the WAMZ.

Despite the fact that the ANOVA test of GDP growth in the WAMZ yielded an encouraging result in the evaluation carried out in this chapter, further steps were taken in this study to investigate business cycles within the WAMZ in order to establish the feasibility of forming a

currency union. In the 'Modern OCA Theory', synchronicity of business cycles and shocks (demand, supply and monetary) are the two major pillars in determining an OCA. This is the basis for the assessment performed in the next session of this chapter.

4.3 Business Cycles

Separate economic policies are not necessary if countries within a monetary union have similar business cycles or rather experience identical shocks. On the other hand, asymmetries in output fluctuations and shocks would appropriately necessitate individual policy responses. Within the context of the OCA theory, countries are better suited to form a currency union the more their business (output) cycles are synchronised or symmetric. Negative correlation of business cycles and shocks however, weakens the case for a common currency. Theoretically, if there is a considerable divergence in the business cycles of a countries coming together to form a monetary union, the future common monetary policy will not be optimal for these countries and 'one size would not fit all'. An expansionary monetary policy will then be more appropriate for the union's member countries experiencing downward moving cycle while the upward trending cycle countries with moderate business cycle fluctuations would employ the contractionary monetary policy stance. However, countries with moderate business cycle fluctuations do not require contractionary or expansionary monetary policy. These are issues that undermine the supports for the formation of a currency union hence the necessity for the presence of business cycle synchronicity before the formation of a monetary union.

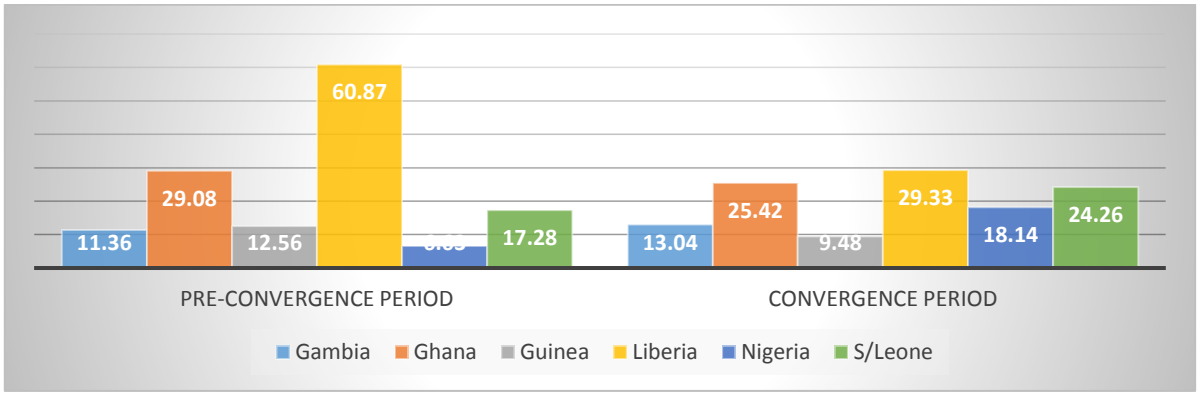
Data and Methods: The approach of this study to the assessment of the business synchronisation of the WAMZ countries was to investigate the similarity and the co-movements between the two main components of business cycles: (i) the classical business cycles and (ii) the deviation business cycles. The classical business cycle, through examination of the swings in the real GDP growth rates, pays attention to the upward and

downward movements in economic activities of the WAMZ countries while the emphasis of the deviation business cycle is on the investigation of the output gap, which is the deviation of the real GDP from a trend, and this is synonymous with the concept of recessions and booms.

The assessment of classical and deviation business cycles in this study applied annual data real GDP and real GDP growth respectively for the WAMZ countries employing simple correlation analyses and the analysis of variance (ANOVA). The ANOVA method would check how significantly different are the means of the two components of business cycles in the WAMZ countries under investigation. The correlation analysis investigates synchronicity while ANOVA examines homogeneity. Further efforts in the investigation was made in measuring synchronicity of business cycle through the observation of the closeness of coefficient of variations of classical and deviation business cycles of individual WAMZ country. It is important to compare patterns of business cycles in the WAMZ countries in times when there were no necessities for meeting criteria for memberships of a monetary union (pre-convergence period) and the monetary union member run-on period when convergence criteria are to be met (convergence period). The business cycle assessment was therefore split into two periods: (i) pre-convergence period (1981-2000); (ii) convergence period (2001 -2012). The comparison of the results in these two periods is necessary because of the possibility of these WAMZ countries behaving 'artificially' in their business attitudes during the convergence era, when efforts were being made to meet the convergence criteria. The HP filtering method (at lambda=100) was applied in filtering and decomposing the real output (GDP) of individual WAMZ countries into transitory and permanent components required for the assessment of classical and deviation business cycles in these countries.

Results and Findings: The patterns of the variations in the real GDP of the WAMZ countries for the Pre-convergence period (1991 to 2000) and the Convergence Period (2001-2015) was displayed in Figure 4.8 below. Liberia recorded the highest degree of dispersion from the mean in both periods, and followed by Ghana. Although, The Gambia appears a bit steady, the pattern of variations demonstrated by the WAMZ countries in these two periods were heterogeneous,

Figure 4.8: Coefficients of Variation of Real GDP of the WAMZ Countries



Source: EIU database and author's calculations

Tables 4.4 and 4.5 below reveal that the degrees of correlation of the classical business cycles in the two periods under study were evidently weak generally, given the low coefficients of correlation. There was a mix of negative and positive correlations in the two periods.

Table 4.4: Correlation Matrix of Classical Business Cycles in the WAMZ (Pre-Convergence Period)

	The Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*Sierra Leone*
The Gambia	1					
Ghana	0.37	1				
Guinea	-0.05	-0.01	1			
Liberia	0.22	0.36	0.27	1		
Nigeria	0.17	-0.09	-0.46	0.20	1	
Sierra Leone	0.18	0.33	-0.25	-0.25	0.31	1

Sources: Author's Estimation and EIU Database and Eviews 7 Output

Table 4.5: Correlation Matrix of Classical Business Cycles in the WAMZ (Convergence Criteria Period)

	The Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*Sierra Leone*
The Gambia	1					
Ghana	-0.52	1				
Guinea	-0.57	0.34	1			
Liberia	-0.41	-0.05	0.41	1		
Nigeria	0.24	0.26	-0.54	-0.83	1	
Sierra Leone	-0.42	-0.30	0.62	0.39	-0.55	1

Sources: Author's Estimation and EIU Database and Eviews 7 Output

In Table 4.4, in the PC phase, the highest degree of correlation of 37% was between Ghana and The Gambia while 61.5% correlation between Guinea and Sierra Leone was the highest in the CC period as shown in Table 4.5

Table 4.6: Correlation Matrix of Transitory Component Business Cycles in the WAMZ (Pre-Convergence Period)

	The Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*Sierra Leone*
The Gambia	1					
Ghana	-0.06	1				
Guinea	0.38	0.43	1			
Liberia	0.50	-0.08	0.15	1		
Nigeria	0.47	-0.27	-0.07	0.69	1	
Sierra Leone	-0.14	-0.10	0.01	0.40	0.59	1

Sources: Author's Estimation and EIU Database and Eviews 7 Output

Table 4.7: Correlation Matrix of Transitory Component Business Cycles in the WAMZ (Convergence Criteria Period)

	The Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*Sierra Leone*
The Gambia	1					
Ghana	-0.17	1				
Guinea	-0.38	0.48	1			
Liberia	0.49	0.40	0.29	1		
Nigeria	-0.49	-0.48	-0.05	-0.87	1	
Sierra Leone	-0.57	0.38	0.89	-0.14	0.272546	1

Sources: Author's Estimation and EIU Database and Eviews 7 Output

For the de-trended business cycle which is the transitory component (cycle) of output, the correlation for the PC and the CC periods were also characterised by weak and negative correlation coefficients among the WAMZ countries. For the transitory business cycles, Table 4.6 and 4.7 above display the correlation in the PC and CC periods. In the PC period, as revealed in Table 4.6, the highest correlation of 68.6% was between Liberia and Nigeria and this fell to a negative of -87% in the CC period. Table 4.7 also shows that the 89% correlation between Guinea and Sierra Leone was the highest for the PC period; followed by The Gambia/Liberia 49% correlation. When output gaps were applied in the test of synchronicity of deviation cycles, there were evidences of weak correlation as Nigeria/Liberia association displays the highest of 68% followed by 59% of Nigeria/Sierra Leone and 59% of Liberia/The Gambia as exhibited in Table 4.8 below. For the CC period, the results in correlation of output gaps in Table 4.9 also reveal many negative and weak

positive correlations. The highest in this phase was the Guinea/Sierra Leone 86% and the Gambia/Liberia 52%. Owing to the implications of high degree of correlation for synchronicity, the results for the PC and the CC periods brought forth the evidences that the classical business cycles, the transitory business cycles and the deviation business cycles in the WAMZ were not synchronised over the period covered by the investigations. This has negative implications for the feasibility of the proposed currency union the West African region in facing business cycle shocks.

Table 4.8: Correlation Matrix of Deviation (Output Gaps) Business Cycles in the WAMZ (Pre-Convergence Criteria Period)

	The Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*Sierra Leone*
The Gambia	1					
Ghana	0.01	1				
Guinea	0.38	0.50	1			
Liberia	0.59	0.23	0.39	1		
Nigeria	0.53	-0.14	0.06	0.68	1	
Sierra Leone	-0.16	-0.04	-0.03	0.33	0.59	1

Sources: Author's Estimation and EIU Database and Eviews 7 Output

Table 4.9: Correlation Matrix of Deviation (Output Gaps) Business Cycles in the WAMZ (Convergence Criteria Period)

	The Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*Sierra Leone*
The Gambia	1					
Ghana	0.07	1				
Guinea	-0.32	0.33	1			
Liberia	0.52	0.49	0.36	1		
Nigeria	-0.53	-0.61	-0.10	-0.88	1	
Sierra Leone	-0.55	0.07	0.86	-0.11	0.32	1

Sources: Author's Estimation and EIU Database and Eviews 7 Output

Evidences gathered from the analyses of variances (ANOVA test) under the three business cycle scenarios and for the PC and the CC periods are specified in Table 3.10 below.[84]

[84]The decision to reject the null hypothesis is taken by examining the probability values (p-values) in the results of the tests. At 5% level of significance, if the resulting p-value is less that that 0.05 or 5%, the null hypothesis is rejected, implying statistical significant difference in the means of the business cycles under investigation.

Table 4.10: Results of ANOVA Tests on Business Cycles in the WAMZ Countries

	F-statistic	*Probability*
Classical Business Cycles:		
* Pre-convergence period	0.5694	0.723
* Convergence	1.7411	0.137
Transitory Components Business Cycles:		
* Pre-convergence period	9.85E-24	1.000
* Convergence	1.91E-25	1.000
Deviation (Output Gaps) Business Cycles:		
* Pre-convergence period	0.0008	1.000
* Convergence	0.0030	1.000

Sources: Author's Estimation and EIU Database

For the classical business cycles, with the p-values of 0.723 for the PC period and 0.137 for the CC period, we cannot reject the null hypothesis to conclude that the means of the classical business cycles (the output growth paths) of the WAMZ countries were similar during the two periods.

Table 4.11: Results of Tests of Homogeneity of Variance (Levene Statistics) in Business Cycles

	(Levene) F-statistic	*Probability*
Classical Business Cycles:		
* Pre-convergence period	9.8379	0.000
* Convergence	4.0693	0.002
Transitory Components Business Cycles:		
* Pre-convergence period	9.7211	0.000
* Convergence	73.9075	0.000
Deviation (Output Gaps)Business Cycles:		
* Pre-convergence period	13.3961	0.000
* Convergence	7.1337	0.000

Sources: Author's Estimation and EIU Database

Since this p-value is greater than 0.05 (for the 5% significant level), the null hypothesis of equality in means of these business cycles cannot be rejected implying that they do not differ significantly in transitory and deviation business cycles in the WAMZ. However, Table 4.11 above shows the Levene's tests of homogeneity of variance among the WAMZ countries under the three scenarios of business cycles reporting p-values of 0.00 for both periods.

A brief summary of evident derived from the correlation and ANOVA tests carried out suggest that while business cycles in the WAMZ were not well synchronised as evident by

the correlation analyses,[85]ANOVA tests revealed homogeneity of business cycles in the zone, though there was heterogeneity in the variances of the zone's business cycles.

Table 4.12: Standard Deviations of the Classes of Business Cycles of the WAMZ Countries (Pre-Convergence Criteria and Convergence Periods)

	Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*S/Leone*
Classical Business Cycle:						
* Pre- convergence period	3.018	0.678	0.934	41.827	9.7135	8.468
* Convergence period	3.942	2.650	1.632	15.715	1.329	7.240
Transitory Component Business Cycle:						
* Pre- convergence period	0.026	0.733	0.033	0.097	0.930	0.053
* Convergence period	0.030	0.781	0.049	0.110	8.689	0.066
Deviation(Output Gap) Business Cycle:						
* Pre- convergence period	5.857	8.849	1.597	54.251	1.539	6.918
* Convergence period	4.400	3.801	1.590	18.232	8.665	4.804

Sources: Author's Estimation and EIU Database

Another look into business cycle synchronicity in the WAMZ was the investigation of the transitory and deviation (output gap) business cycles so as to determine the extent of cyclical convergence of members of the proposed monetary union, which is relevant for the conduct of the future common monetary policy in the zone. This test was carried out through the evaluation of the evolution of (dispersions) standard deviations of these classes of business. The smaller the degree of dispersion (measured by standard deviation) over the period investigated, the closer the clustering of individual WAMZ countries' business cycle. This measures absolute degree of dispersion. Table 4.12 above shows that for all the WAMZ countries, the standard deviations of the transitory business cycles for the PC and the CC periods generally were low and less than unity while the deviation (output gaps) business cycles and the classical (growth) business cycles for all the WAMZ countries exhibit single digits standard deviation apart from Liberia which recorded for the deviation (output gaps) business cycle, highs of 54.25 and 18.23 standard deviations in the PC period and the CC

[85]Correlation is an indicator of business cycle synchronisation.

period respectively as this country displayed 41.83 and 15.71 standard deviation for the growth business cycle in the two periods.

Table 4.13: Results of Estimates of Euclidean Distances between Output Gaps in WAMZ Countries

	Euclidean Distances (Pre-Convergence Period)	***Euclidean Distances (Convergence Period)***
Gambia-Ghana	0.002617	0.12601
Gambia-Guinea	0.001836	0.001689
Gambia-Nigeria	0.51388	0.00578
Gambia-Liberia	0.001957	0.297233
Gambia-Sierra Leone	0.04867	0.00603
Ghana-Guinea	0.00078	0.127698
Ghana-Liberia	0.5165	0.12023
Ghana-Nigeria	0.00066	0.423242
Ghana-Sierra Leone	0.05129	0.132039
Guinea-Liberia	0.51572	0.00747
Guinea-Nigeria	0.000121	0.295544
Guinea-Sierra Leone	0.05051	0.004341
Liberia-Nigeria	0.515839	0.303012
Liberia-Sierra Leone	0.465208	0.011809
Nigeria-Sierra Leone	0.05063	0.2912

Sources: Author's Estimation and EIU Database

From Table 4.13above, the evidences gathered from the estimates of the fifteen bilateral Euclidean distances between output gaps in the WAMZ further revealed the degree of business cycle co-movements among member countries. The rule is that the lower the value of the bilateral Euclidean distance, the higher the degree of similarities in business cycles of the two countries.

In the PC period, Guinea/Nigeria had the highest degree of business cycle similarity as evident by the lowest Euclidean distance of 0.000121, followed by Ghana/Nigeria, Ghana/Guinea and The Gambia/Guinea recording 0.00066, 0.00078 and 0.001836 bilateral Euclidean distances respectively. The lowest degree of business cycle similarity in the PC era is displayed by Liberia/Nigeria at 0.51584 bilateral Euclidean distance. For the CC period, Gambia/Guinea produced the highest degree of business cycle co-movement at 0.001689 Euclidean distances as Guinea/Sierra Leone (0.00434), The Gambia/Sierra Leone (0.00603) and Guinea/Liberia (0.00747) follow. Displaying a Euclidean distance of 0.42324,

Ghana/Nigeria implies the lowest degree of business cycle co-movement in this era. The tests of Euclidean distances showed that in the PC period, Ghana, Guinea, Nigeria were prominent with high degrees of business cycle co-movements while Guinea, Sierra Leone and The Gambia reflected same during the CC era. However, many of the bilateral Euclidean distance obtained for the PC period differ from the evidence got for the CC period. The results for the PC period were more encouraging than those of the monetary union run-up CC period. For instance, Guinea/Nigeria showing the highest degree of co-movement in the PC period fell to the group of the 'least' during the CC period. Nevertheless, it is encouraging that the results of the monetary union run-up CC period exhibits seven (7) 'drops' in the Euclidean distances when compared to what obtained for the PC period. This depicts appreciable journey towards business cycle co-movements in the WAMZ. The conclusion for the estimates of Euclidean distances between output gaps is the failure of these countries to exhibit many desired low bilateral values that would have suggested reasonable extent of business cycles similarities and co-movements in the WAMZ as this would have arouse the confidence in concluding that the zone is feasible for a monetary union.

4.4 Inflation

Similarities in inflation is one of the properties of an optimum currency area (OCA). Literatures on inflation (as a property of an OCA) have been able to spell out the implications of inflation rates similarities among members or would- be members of a monetary union. If a common currency area has differences in the trends of inflation rates among its member countries, there would be more difficulties in maintaining the fixed exchange rate regime as required of a monetary union due to the underlying general price level persistence behaviour and variability factor. Apart from this, the heterogeneous inflation patterns in a monetary union can propel external imbalances and at the same time, lead to unstable terms of trade. However, if terms of trade in member countries are stable, the need for various individual

exchange rate in the currency union would be down played. Further emphasis of inflation convergence was made by Mundell (2000) who asserted the importance of inflation rate similarities for a currency union in fixing exchange rate easily

Dissimilarities in inflation rate connote strong signals of differences in economic structures and in the conducts of individual country's economy and if these inflation dissimilarities becomes wider and persistence, this has an implication of 'one size does not fit all'. Additional point in favour of the essence of inflation rates similarities for a currency union is the presumable low cost of being a member of the union because fiscal and monetary stance similarities are the root causes of inflation similarities. Divergences in the inflation rates will make currency union members to face 'real interest rate differentials'. The high inflation member countries with sound economic growth may take advantage of the implied 'low interest rate' which further stimulates those economies concerned, but to the disadvantage of the low inflation-low growth member countries.

Data and Methods: Annual data of consumer price index and GDP deflator inflation for the WAMZ countries, the United States (US) and the EMU employed here spans between 1980 and 2015. Data analyses were performed into six-fold. At first and second stages, analyses of the descriptive statistics and inflation correlation among the WAMZ countries were made. At the third stage of analyses, inflation convergence was investigated towards checking the feasibility of exchange fixation in the monetary zone through the measure of absolute inflation rate differentials generated by the deviations of the US and the Eurozone's inflation rates from the WAMZ's individual member's inflation rate.[86] The differential inflation rates for each country were averaged over the periods covered. Low average inflation deviations

[86] Absolute values of these deviations are taken in order to avoid the opposite sign value cancellations.

translate into high level of inflation convergence. A WAMZ country exhibiting high differential inflation in these assessments are not feasible for exchange rate fixation with the US *dollars* or the *euro* (as appropriate).

The absolute inflation rate differential measure of inflation convergence were generated for each WAMZ country as:

$$INFD = \pi_t - \pi_{US_t/EMU_t} \quad 4.6$$

where $INFD$ is inflation differential, π_t is the inflation rate for the assessed WAMZ country and $\pi_{US_t/EMU_t}$is the inflation rates for the US or EMU (as appropriate). Due to data constraints, these analyses were split into two sub periods: (i) the 12-year pre-convergence period (1989-2000) and (ii) the 12-year period convergence period (2001-2012). In the fourth aspect of analyses, differentials between WAMZ's member countries inflation rates and the reference value of 5% inflation rate (expressed as the convergence criterion) were estimated and evaluated. This assessed the degree of divergence from the inflation target of the future common central bank for the zone. These were estimated as:

$$INFD = \pi_t - \pi^* \quad 4.7$$

where π^* is the convergence criterion policy inflation target rate of 5%. Inflation rate differential analyses under this approach cover the 12-year convergence period (2001-2012). The fifth approach was to check inflation rates misalignments by calculating the annual inflation rate differentials as deviations for the WAMZ's average inflation over the convergence 12-year period of 2001 to 2012. These were generated as:

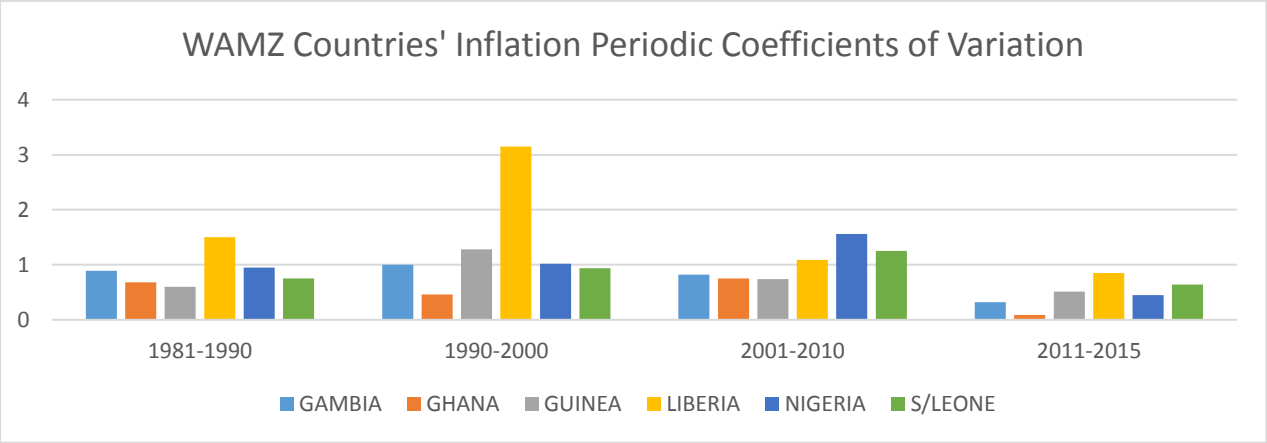
$$INFDF = \pi_t - \pi_{WAMZ}^{AV} \quad 4.8$$

where π_{WAMZ}^{AV} is the average inflation rate for the WAMZ over the convergence period (2001-2012). Effort were made to analyse the correlation of the inflation differentials under the three approaches so as to establish similarities (or otherwise) inflation trends and patterns in the

WAMZ countries. The sixth and final approach was to appraise the time series properties of the inflation rate deviations under the three approaches emphasising the deviations from the convergence benchmark of 5% inflation rate as this establishes if there are evidence of consistent/persistent impacts of idiosyncratic shocks that affects inflation rates in the WAMZ countries. Here, unit root tests were carried out to determine the order of integration of the inflation deviation and to reveal if they are stationary or not.

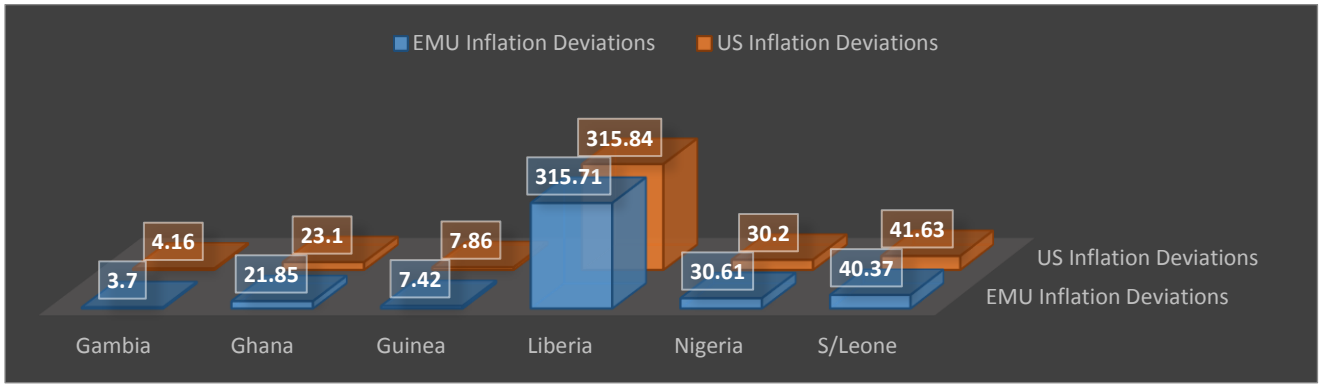
Results and Findings: The pattern of the coefficients of variation of 4-periodic inflation are displayed in Figure 4.9 below. Over the pre-convergence periods (1981-1990 and 1991-2000) and the convergence periods (2001-2010 and 2011-2015), it is interesting to note that the degree of dispersion subsided during the second phase of the convergence period despite higher degrees of dispersion in the previous three periods. Ghana recorded the lowest dispersion in this latter period. What happened during the last phase is a reflection of improvements in the convergence of inflation variations with the WAMZ.

Figure 4.9: Inflation Periodic Coefficients of Variation for the WAMZ Countries



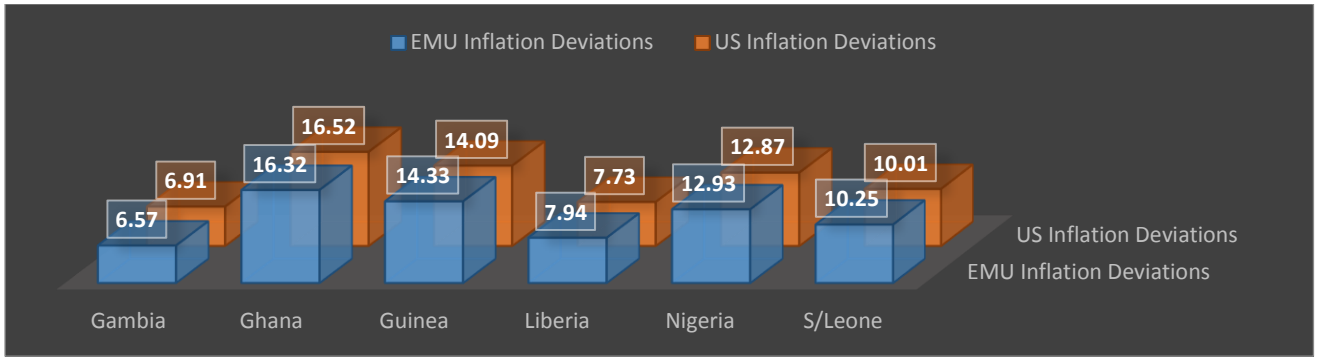
Sources: Author's Estimation and EIU Database

Figure 4.10: WAMZ Countries' Inflation Deviations from EMU and US Inflation Rates (Pre-convergence Period)



Sources: Author's Estimation and EIU Database

Figure 4.11: WAMZ Countries' Inflation Deviations from EMU and US Inflation Rates (Convergence Criteria Period)



Sources: Author's Estimation and EIU Database

The results of inflation convergence investigated by the means of measuring absolute inflation rate differentials generated through deviations of the US and the Eurozone's inflation rates from the WAMZ's individual member's inflation rate are shown in Figures 4.10 and 4.11 above.

It is necessary to state that high variation in Liberia during the 1991-2000 period was due to the 1998 huge war-time inflation of 3,737.22%. If this outlier is expunged from the country's inflation estimation, the country's position would have been much more different.

Table 4.14: Correlation Matrix of WAMZ Countries' Inflation Deviations from Eurozone Inflation Rates

Pre-convergence Criteria (PC)Period

	The Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*Sierra Leone*
The Gambia	1					
Ghana	0.12	1				
Guinea	0.65	-0.32	1			
Liberia	-0.11	-0.42	-0.25	1		
Nigeria	-0.14	0.40	0.07	-0.23	1	
Sierra Leone	0.74	-0.25	0.90	-0.15	0.004	1

Convergence Criteria (CC)Period

	The Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*Sierra Leone*
The Gambia	1					
Ghana	0.71	1				
Guinea	-0.39	-0.65	1			
Liberia	-0.13	0.01	-0.34	1		
Nigeria	-0.23	-0.28	0.08	-0.18	1	
Sierra Leone	-0.40	-0.63	0.33	-0.22	0.07	1

Sources: Author's Estimation, EIU Database and EViews 7 Output

These exhibit the pattern and extent of inflation deviation of the WAMZ countries in terms of feasibility in exchange rate fixation with the euro and the US dollars. Simple interpretation of these results is that the lower the differential, the higher the inflation convergence with the respective currency (the euro/US dollar) and the stronger the argument in favour of exchange rate fixation with the respective currency. A country displaying high inflation deviation from these currencies is not feasible as a part of the monetary union, for exchange rate fixation with the single currency.

Table 4.15: Correlation Matrix of WAMZ Countries' Inflation Deviations from US Inflation Rates

Pre-convergence Criteria (PC)Period

	The Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*Sierra Leone*
The Gambia	1					
Ghana	0.10	1				
Guinea	0.71	-0.36	1			
Liberia	-0.28	-0.41	-0.20	1		
Nigeria	0.08	0.48	0.17	-0.37	1	
Sierra Leone	0.76	-0.27	0.90	-0.14	0.04	1

Convergence Criteria (CC)Period

	The Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*Sierra Leone*
The Gambia	1					
Ghana	0.75	1				
Guinea	-0.39	-0.66	1			
Liberia	-0.11	0.02	-0.36	1		
Nigeria	-0.17	-0.23	-0.01	-0.25	1	
Sierra Leone	-0.40	-0.62	0.34	-0.19	-0.02	1

Sources: Author's Estimation, EIU Database and EViews 7 Output

Table 4.16: Correlation Matrix of WAMZ Countries' Inflation Deviations from Convergence Criterion Inflation (5%) Rate (Convergence Criteria Period)

	The Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*Sierra Leone*
The Gambia	1					
Ghana	0.77	1				
Guinea	-0.49	-0.61	1			
Liberia	-0.25	-0.45	0.03	1		
Nigeria	-0.24	-0.35	0.04	-0.07	1	
Sierra Leone	-0.42	-0.63	0.52	0.19	-0.23	1

Sources: Author's Estimation and EIU Database and Eviews 7 Output

An important feature of the results is the similarities in the Eurozone/US deviation results for the WAMZ countries displayed in Tables 4.14 and 4.15. In the pre-convergence period, The Gambia was the most feasible member of the proposed single currency for the euro and US dollar exchange rate fixation just as Liberia was the least feasible. In the convergence era, The Gambia was consistence with her number one ranking and Liberia moved up to the second position while Ghana is the least candidate for exchange rate fixation with the *euro*/US *dollar*. Table 4.16 above gives the correlation matrix of the deviation of the WAMZ countries' inflation rates from the target rate during the convergence period. The results revealed negative correlation among the WAMZ countries while those positive correlation

were very weak. The correlation matrix of the target rate differentials in Table 4.17 below reflects many negative correlation coefficients indicating huge dissimilarities among the WAMZ countries in this regard.

Table 4.17: Correlation Matrix of WAMZ Countries' Inflation Deviations from WAMZ's Average Inflation (Convergence Criteria Period)

	The Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*Sierra Leone*
The Gambia	1					
Ghana	0.66	1				
Guinea	-0.42	-0.64	1			
Liberia	-0.13	-0.54	0.15	1		
Nigeria	-0.29	-0.13	-0.09	-0.28	1	
Sierra Leone	-0.38	-0.65	0.54	0.24	-0.28	1

Sources: Author's Estimation and EIU Database

Table 4.18: Ng-Perron Unit Root Tests on Deviations of WAMZ Inflation from Inflation in Eurozone and US.

Pre-convergence Period (WAMZ/Eurozone)					
Country	***MZa***	***MZt***	***MSB***	***MPT***	***Decision***
Gambia	-2.433	-1.012	0.416	9.487	***Non-stationary***
Ghana	-18.332	-3.026	0.165	1.340	***Stationary***
Guinea	-2.277	-1.026	0.450	10.432	***Non-stationary***
Liberia	-5.419	-1.642	0.303	4.531	***Non-stationary***
Nigeria	-5.453	-1.651	0.303	4.493	***Non-stationary***
Sierra Leone	-6.414	-1.708	0.266	4.054	***Non-stationary***
Pre-convergence Period (WAMZ/US)					
Country	***MZa***	***MZt***	***MSB***	***MPT***	***Decision***
Gambia	-2.321	-1.016	0.438	10.098	***Not stationary***
Ghana	-16.730	-2.891	0.173	1.468	***Stationary***
Guinea	-2.880	-1.175	0.407	8.403	***Not stationary***
Liberia	-5.419	-1.641	0.303	4.532	***Not stationary***
Nigeria	-5.420	-1.646	0.304	4.520	***Not stationary***
Sierra Leone	-6.519	-1.722	0.264	3.998	***Not stationary***
Convergence Period (WAMZ/Eurozone)					
Country	***MZa***	***MZt***	***MSB***	***MPT***	***Decision***
Gambia	-3.391	-1.264	0.373	7.177	***Not stationary***
Ghana	-84.453	-6.482	0.077	0.320	***Stationary***
Guinea	-4.055	-1.416	0.349	6.045	***Not stationary***
Liberia	-5.122	-1.589	0.310	4.805	***Not stationary***
Nigeria	-4.912	-1.550	0.315	50.19	***Not stationary***
Sierra Leone	-2.360	-0.610	0.258	7.667	***Not stationary***
Convergence Period (WAMZ/US)					
Country	***MZa***	***MZt***	***MSB***	***MPT***	***Decision***
Gambia	-3.321	-1.246	0.375	7.315	***Not stationary***
Ghana	-141.086	-8.387	0.059	0.191	***Stationary***
Guinea	-4.017	-1.409	0.351	6.102	***Not stationary***
Liberia	-5.189	-1.601	0.308	4.742	***Not stationary***
Nigeria	-3.811	-1.362	0.357	6.428	***Not stationary***
Sierra Leone	-1.652	-0.444	0.268	8.426	***Not stationary***

Source: Author's Computation, Eviews Output and EIU Database

As the future common central bank for the WAMZ requires information on time series properties on inflation when giving future inflation targets and designing monetary policy, evidence of the unit root behaviour of the properties of inflation differentials under the three approaches in this study are exhibited in Tables 4.18 above and 4.19 and 4.20 below as derived from the Ng-Perron unit root tests with constant and trend at 5% significance level.

Table 4.19: Results of Ng-Perron Unit Root Tests on Deviations of WAMZ Inflation from Convergence Criterion (5%) Inflation Rate

Convergence Period Only					
Country	***MZa***	***MZt***	***MSB***	***MPT***	***Decision***
Gambia	-3.041	-1.198	0.394	7.965	***Not stationary***
Ghana	-37.342	-4.294	0.115	0.728	***Not Stationary***
Guinea	-3.925	-1.394	0.355	6.243	***Not stationary***
Liberia	-4.379	-1.480	0.338	5.595	***Not stationary***
Nigeria	-3.577	-1.323	0.370	6.840	***Not stationary***
Sierra Leone	-2.474	-0.746	0.301	7.984	***Not stationary***

Source: Author's Computation, Eviews Output and EIU Database

Apart from Ghana under the deviation from *euro*/US *dollar*, these properties produce evidences that the null hypothesis of unit root could not be rejected under the four scenarios for all the WAMZ countries, implying non-stationary deviations suggesting that shocks to inflationary trends in the WAMZ would have permanent and long lasting effects on inflation rates in the zone as inflation may not return to the trend path overtime.

Table 4.20: Ng-Perron Unit Root Tests on Deviations of WAMZ Inflation from WAMZ's Average

Convergence Period Only					
Country	***MZa***	***MZt***	***MSB***	***MPT***	***Decision***
Gambia	-4.024	-1.403	0.348	6.096	***Not stationary***
Ghana	-6.615	-1.757	0.265	3.885	***Not Stationary***
Guinea	-4.477	-1.487	0.332	5.484	***Not stationary***
Liberia	-4.657	-1.524	0.327	5.263	***Not stationary***
Nigeria	-2.913	-1.150	0.395	8.232	***Not stationary***
Sierra Leone	-3.026	-0.864	0.285	7.268	***Not stationary***

Ng-Perron 5% Critical Values			
MZa	***MZt***	***MSB***	***MPT***
-8.100	-1.980	0.233	3.170

Source: Author's Computation, Eviews Output and EIU Database

What these suggest is that the cost implications of following disinflationary policies in WAMZ countries may be high while it is very likely to be difficult forecasting or predicting future

inflation movements which are based on past inflationary behaviours. These properties of integration of inflation rate differential are very revealing for inflation rate convergence among WAMZ member countries.

4.5 Production Structures

As indicated earlier, the OCA criteria for joining a monetary union centre on the probability of potential members facing similar economic disturbances which will enable a common monetary policy to successfully adjust to such shocks. A fundamental position in economics is that similar structural economic shocks could be handled within a monetary union if there are similarities in the production structures of members. This is a key property on the OCA theory. It is therefore significant if this criterion is assessed in the context of the WAMZ countries in order to determine if output market shocks that may affect a member country as well as other members of the monetary integration would be minimised by an indication of production structure similarities.

Data and Methods: Employing annual data of agricultural, industrial manufacturing and service sectors of the respective WAMZ economies over a period between 1997 and 2015, this study evaluates the degree of similarities in the production structures of the WAMZ countries. A statistical measure of structural synchronicity initiated by Krugman (1991) was applied and computed thus:

$$PS_{i,WAMZ} = \sum_{k=1}^{J}\left(PS_{j,i} - PS_{j,WAMZ}\right) \quad 4.9$$

where $PS_{i,WAMZ}$ is the extent of similarity in production structure between country i and the WAMZ, $PS_{j,i}$ is the weight of gross value added by sector j in the total valued added for country i, $PS_{j,WAMZ}$ is the weight of the gross valued added by sector j in the total valued added for the whole of the WAMZ. J is the number of the sectors of the economy employed

in the study. Agriculture, industry, manufacturing and services were the sectors considered for this evaluation. The rule for the determination of synchronicity here is that the closer $PS_{i,WAMZ}$ is to zero, the more the extent of similarity in economic characteristics of country i and the WAMZ.

Results and Findings: Table 4.21 below reveals information on 20-year averages and 3-year moving averages of the value added by agriculture, industry and services sectors of the WAMZ economies, (scaled by GDP). The sharp contrast revealed by the averages in the three sectors was the heavy dependence of The Gambia, Ghana and Nigeria on service sector as against Sierra Leonean strong dependence on the agricultural sector. Sectorial dependence were above 50% of the GDP in these countries. Ghana, Guinea and Nigeria bear similarities in reliance on agriculture.

Table 4.21: Similarities in Production Structure: Value Added by Agriculture, Industry and Services as Annual Percentage of GDP (20-year Average and 3-year Moving Averages)

	Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*S/Leone*
Agriculture:						
2012-2014	22.24	23.05	20.30	35.08	21.09	59.22
2011-2013	23.23	24.26	20.95	39.54	21.78	57.71
2010-2012	25.92	26.82	21.55	42.71	22.74	56.61
1995-2014	24.11	32.14	22.42	64.85	22.39	54.82
Industry:						
2012-2014	14.66	28.45	38.99	15.00	26.10	7.61
2011-2013	15.01	27.97	41.42	13.23	27.23	8.18
2010-2012	14.34	25.00	43.80	9.91	27.00	8.28
1995-2014	15.11	23.20	36.21	7.45	34.52	15.59
Services (%):						
2012-2014	63.10	52.10	40.71	44.08	52.81	33.17
2011-2013	61.76	50.87	37.63	45.51	50.99	34.10
2010-2012	59.93	51.38	34.62	47.38	50.26	35.10
1995-2014	60.77	44.08	41.37	26.83	43.09	29.60

Source: EIU Database and Author's Estimations

The Gambia and Liberia on one hand and Ghana and Nigeria on the other hand exhibit respective similarities in the industrial sector. For the WAMZ economies at large (apart from Sierra Leone), it was evident that the service industry was of the highest importance

generating between 44% and 63% of the GDP. It can therefore be inferred here that there were few similarities in the WAMZ production structures.

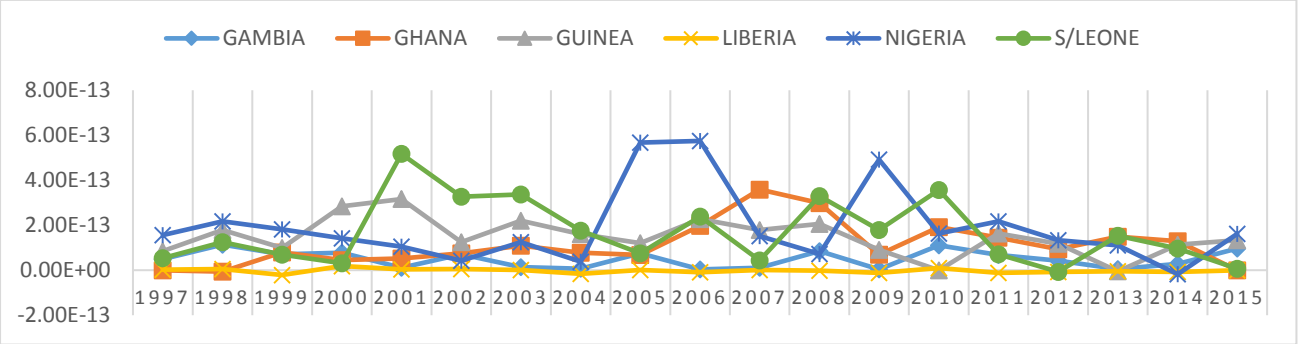
Table 4.22: Similarities in Production Structure: Value Added by Agriculture, Industry and Services Annual Percentage Real Change (20-year Average and 3-year Moving Averages)

	Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*S/Leone*
Agriculture:						
2012-2014	-1.31	4.21	2.68	2.51	4.64	3.13
2011-2013	-6.58	2.94	5.47	3.93	4.19	4.43
2010-2012	-2.27	2.81	4.07	5.71	5.14	4.10
1995-2014	2.93	3.56	3.93	8.74	7.67	5.15
Industry:						
2012-2014	0.74	6.16	1.79	38.97	3.78	6.17
2011-2013	5.43	19.78	2.81	54.88	4.33	9.51
2010-2012	5.53	19.88	3.07	46.78	5.71	10.63
1995-2014	2.98	7.58	3.65	23.53	3.35	2.76
Manufacturing:						
2012-2014	3.71	0.21	0.29	4.73	16.66	-0.22
2011-2013	3.19	6.15	2.10	6.14	17.69	7.15
2010-2012	2.27	8.85	2.01	5.73	12.96	9.36
1995-2014	2.57	4.04	2.60	12.98	7.57	0.41
Services:						
2012-2014	5.98	9.22	2.80	6.18	6.40	4.62
2011-2013	5.18	10.49	4.45	8.71	5.75	6.26
2010-2012	4.44	10.43	2.75	9.14	6.82	6.52
1995-2014	4.17	10.67	2.05	14.91	7.91	5.88

Source: EIU Database and Author's Estimations

Table 4.22 above reveals the averages of the annual percentage of real changes in production structures of the WAMZ countries. In the agricultural sector, only The Gambia exhibits negative real changes in the 3-year moving averages, while other member countries show close similarities in values between 2% and 6%. In the service sector, Liberia demonstrates high degree of annual change than other WAMZ countries which exhibit unit increases. There were highest degree of annual changes in value added to national production by Nigeria and Ghana respectively in manufacturing and services sectors.

Figure 4.12: Plots of Index of Similarity of Production Structures in the WAMZ



Source: EIU Database and Author's Estimations

Apart from these double digit outliers, there are no tangible differences in the rate of annual changes in the value added to production by the three sectors in the WAMZ economies. Figure 4.12 above reveals that the index of production structure similarity generated for all the six WAMZ countries are very close to zero, indicating huge similarities of these countries production structure and that of the WAMZ as a whole. There were some disparities up till 2010, but from 2011 to 2015, there were huge degree of convergences as these economies were more closely similar to that characterised by the WAMZ. This significant results of similar production characteristics have positive implication for the synchronicity of economic disturbances within the WAMZ as this will make a common monetary policy to suffice in addressing adjustments to economic shocks.

4.6 Openness to Trade and Investments

One of the important criteria of the traditional OCA theory is trade openness emphasised by Kenen (1969). This extends to exports diversification and intensities of intra-regional and intra-industry trade among member countries of an OCA. Intra-regional trade intensity is the degree of trade linkages between countries within a region and the degree of this linkage in trade is revealed by the analysis of the bilateral trade intensity ratio (BTIR). This ratio measures the extent of bilateral trade between two countries relative to the trade of a particular country with the world. It goes on to show how large or small trade transactions are, relative to what is expected, considering the share of each country in world's trade. This

section of the research aims at exposing how closely linked are trades among the members of the WAMZ as a proposed monetary union as well as revealing if the feasibility of the future currency union would be guaranteed by the empirically determined the OCA property of trade intensities between these economies. It is believed that when there is high degree on intra-regional trade intensity, countries involved would be subjected to symmetric shocks that may emanate from synchronised business cycles. Nevertheless, exchange rate risks and uncertainties are eliminated inasmuch these member countries face reduced transaction costs. It is therefore significant to assess intra-regional trade intensities with the WAMZ.

Data and Methods: Relevant trade data for the six WAMZ countries were sourced from the United Nations Commodity Trade Statistics Database. These exports and imports data cover the period of analysis, which is 1995-2012. Apart from BTIR, trade openness (derived as the sum of exports and imports, deflated by GDP) were estimated for the WAMZ countries. The measure of BTIR constructed for the WAMZ countries in this study was export-proxy BTIR, restricted to export data. Consequently, the WAMZ specific bilateral trade intensity ratio was constructed as the share of a WAMZ country's export going to a partner WAMZ country, divided by the share of WAMZ's total exports to the partner. This is expressed as:

$$BTIR(i,j,\tau) = \left(\frac{x_{ij}}{x_i + x_j}\right)\tau \qquad 4.10$$

where $BTIR(i,j,\tau)$ is the bilateral trade intensity ratio between country i and country j for average trade over the period, x_{ij} is the total annual nominal exports of country i to country j; x_i is the total annual nominal exports of country i to all other WAMZ countries; x_j is the total annual nominal exports of country j to all other WAMZ countries and τ is the average of exports over the period investigated. The higher the BTIR between two WAMZ countries, the higher the degree of trade linkage between the two countries.

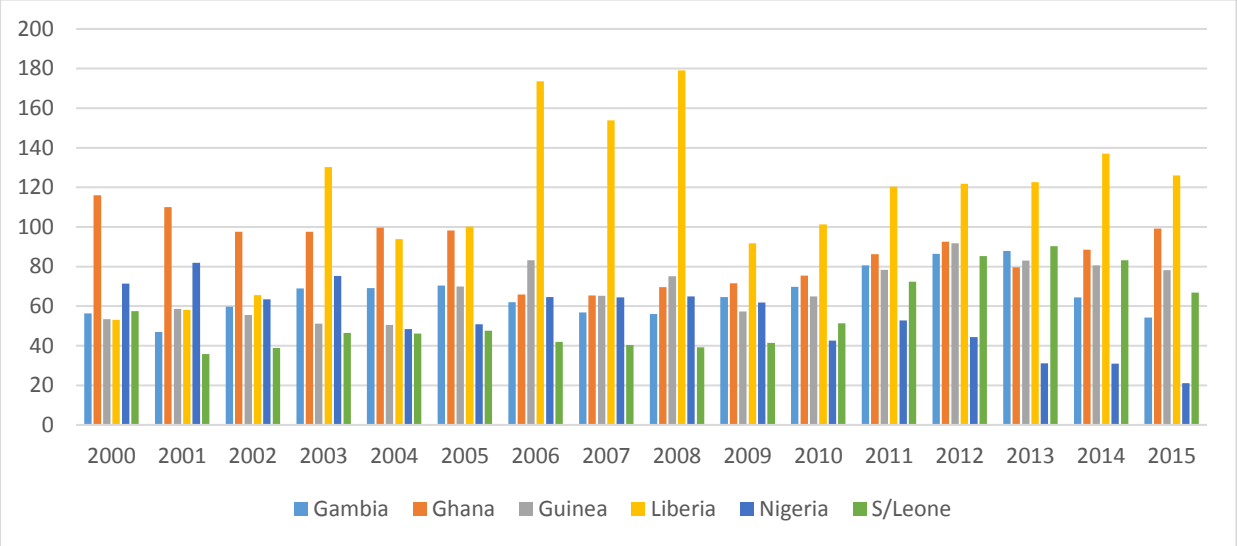
Results and Findings: The trade openness results estimation exhibited in Table 4.23 below gives evidence to conclude that Liberia is the most opened economy within the WAMZ. Figure 4.13 below shows the plot of the degree of openness of these countries.

Table 4.23: Trade Openness in the WAMZ Countries (2000-2015)

	Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*S/Leone*
2000	56.36	116.05	53.48	53.01	71.38	57.53
2001	46.93	110.05	58.60	58.03	81.81	35.78
2002	59.64	97.49	55.45	65.53	63.38	38.83
2003	68.86	97.49	51.14	130.19	75.22	46.39
2004	69.05	99.67	50.44	93.86	48.45	46.14
2005	70.31	98.17	69.90	100.07	50.75	47.52
2006	61.95	65.92	83.21	173.54	64.61	41.91
2007	56.80	65.35	65.18	153.76	64.46	40.30
2008	56.05	69.51	75.01	179.12	64.97	39.21
2009	64.61	71.59	57.33	91.69	61.80	41.44
2010	69.81	75.38	64.88	101.28	42.65	51.27
2011	80.64	86.19	78.38	120.32	52.79	72.35
2012	86.44	92.54	91.69	121.88	44.38	85.27
2013	87.80	79.66	83.06	122.63	31.03	90.25
2014	64.42	88.45	80.62	136.97	30.88	83.19
2015	54.19	99.25	78.10	126.02	21.12	66.80

Source: World Bank Database and Author's Estimation

Figure 4.13: Plot of Trade Openness in the WAMZ Countries (2000-2014)



Source: World Bank Database and Author's Estimation

Table 4.24: Intra-WAMZ Bilateral Trade Intensity Ratios (BTIR) for WAMZ Countries

Exports: from:	to:	
The Gambia	Ghana	0.20
The Gambia	Guinea	14.03
The Gambia	Liberia	0.17
The Gambia	Nigeria	0.06
The Gambia	Sierra Leone	1.12
Ghana	The Gambia	2.44
Ghana	Guinea	1.85
Ghana	Liberia	2.18
Ghana	Nigeria	8.30
Ghana	Sierra Leone	2.05
Guinea	The Gambia	1.65
Guinea	Ghana	0.43
Guinea	Liberia	16.22
Guinea	Nigeria	0.31
Guinea	Sierra Leone	20.01
Liberia	The Gambia	1.06
Liberia	Ghana	0.57
Liberia	Guinea	2.05
Liberia	Nigeria	0.03
Liberia	Sierra Leone	7.83
Nigeria	The Gambia	0.04
Nigeria	Ghana	88.44
Nigeria	Guinea	0.71
Nigeria	Liberia	1.69
Nigeria	Sierra Leone	0.25
Sierra Leone	The Gambia	5.51
Sierra Leone	Ghana	0.22
Sierra Leone	Guinea	4.26
Sierra Leone	Liberia	2.36
Sierra Leone	Nigeria	0.14

Source: World Bank Database and Author's Estimations

Table 4.24 above gives the 15-year intra-WAMZ bilateral trade intensity ratios information on trade openness for the period spanning between 2000 and 2014, showing close similarities. Guinea appears to be the highest bilateral trade intense economy within the WAMZ as evident by the high BTIR with The Gambia (14.03), with Liberia (16.20) and with Sierra Leone (20.01). In spite of these, the highest degree of bilateral trade ratio is between Ghana and Nigeria with a ratio of 88.44. If Ghana and Nigeria are WAMZ's big economies, this result has positive implication for the monetary integration.

4.7 Financial Integration and Financial System Convergence

The essence of financial market integration assessment of the feasibility of a single currency area was stressed by Ingram (1969) in which it was emphasised that the higher the level of financial integration, the greater the extent of the need to establish an optimum currency area across geographical blocs, and that financial market integration reduces the need for exchange rate adjustments as well as the need to change inter-regional or intra currency area terms of trade through fluctuations in exchange rate. Therefore, it is essential to have strong financial market integration if the sustainability of a currency area is to be assured. Given these and in line with suggestions by economic theories and findings from empirical assessments, financial integration is likely to enhance economic growth and at same time, an important issues for a monetary union. Because the implementation of the single monetary policy in a monetary union is implemented through the financial systems, it is necessary that various financial systems involved should reflect common characteristics and be efficient as much as possible so as to guarantee smooth and effective transmission mechanism of the common monetary policy. Therefore, the way monetary policy mechanism may effectively work is determined by the extent of financial integration which will in turn, have financial stability implications for the financial system.

It is consequently of high significance to assess the degree of financial integration of the WAMZ as a proposed monetary union. The transmission of the WAMZ's common monetary policy will be more effective the more the financial systems within the WAMZ are well integrated. This is because if the degree of financial integration within the WAMZ is not sufficiently high, there can be problems relating to common economic shock and common monetary policy transmission. A higher degree financial integration has the implication that the WAMZ-wide shocks dominates and a common monetary policy will be effectively suffice to address the common disturbances. On the other hand, if financial market

integration in the WAMZ is weak, country-specific-shocks prevails and this reduces the effectiveness of the WAMZ's common monetary policy which will not suffice to address common shocks with the proposed monetary union.

The implementation and conduct of a common monetary policy will be much easier if the financial systems within a currency area functions in a like manner. For instance, when the monetary authority changes its policy on interest rate, the effect of this will be rapid and intense in a country that predominantly indexes loans to short term interest rate than how this will be felt in countries that majorly operate fixed interest rate contracts. Basically, this entails that if a group of countries operates similar financial systems, the operations of a common monetary policy would easily be facilitated and hence such countries are good candidates of an OCA. Principally, all the WAMZ economies are bank-based. The implication of this is that these countries do not primarily rely on the security markets for sourcing of funds and investment of surplus funds as well as the general financial intermediation activities. This therefore encouraged the evaluation of the similarities in some banking sector indicator of domestic credit granted to private sectors by deposit money banks in the WAMZ countries (as scaled by GDP). Further evaluation of interest rate spreads across the WAMZ was performed.

The three broad categories of measures of financial integration are: (i) price-based measures; (ii) quantity-based measures; and (iii) news-based measures (Baele et al, 2004). Price-based measures which directly investigates the law of one price (LOOP) gauge assets price/returns discrepancies caused by the assets' geographic origin. LOOP must be established if there is complete financial integration. This measure may can either be direct price/yield-based method (testing is the assets hugely have same characteristics) or country-effect method (testing if there are differences in systematic risks factors and other relevant features).Quantity-based methods relates to quantifying the effects of frictions faced by

demand and supply forces affecting investment opportunities. Ease of market access and cross-border holdings of institutional investors are good measures under this category. News-based method measure information effect as distinguished from other barriers and frictions. Specifically here, financial integration should reflect perfect diversification of assets portfolios. Therefore, local or regional news is expected to have little impact on prices as against relative huge impact of global news, which is of importance; this depicting identical degree of systematic risks across financial assets in different countries. By implications, financial integration is not perfect if local news greatly continue to have significant influence on prices of assets.

Data and Methods: Because the WAMZ member economies are bank-based economies, this (as a crucial factor) constrained this study to employ the assessment of an element of the price-based measures (money market measures) in gathering the evidence about the degree of financial integration and financial systems convergence in the WAMZ. This is a cost of financial intermediation measures of the spread between interest rates of the member countries. For the WAMZ countries, interest rates spread was generated as:

$$IRS = i_L - i_D \qquad 4.11$$

where IRS_i is interest rate spread i_L lending and i_D deposit interest rates respectively. This assessment method is in addition to the evaluation of domestic credits granted to private sectors by deposit money banks within the WAMZ (a banking sector activity indicator). The evaluation of interest rate spread (the difference between lending and deposit rates) assesses level of linkages between national financial markets of WAMZ's candidate countries. If these interest spreads converge, this indicates money markets convergence and financial system integration. Downward trends of the spread show financial intermediation efficiency. These are methods appropriate for bank-based economies as obtained across the WAMZ. The patterns of the coefficients of variation of these indicators were evaluated for both pre-

convergence and convergence periods. The coefficient variation is the best way to summarise and compare variations, particularly when standard deviation increases as average increases. Generally, coefficient of variation is expressed as ratio of standard deviation and mean calculated thus:

$$CofV = \left(\frac{\sigma}{\bar{x}}\right) \qquad 4.12$$

where σ is standard deviation and $\bar{x}$ is mean.[87] Analysis of financial market integration in the WAMZ was performed with the evaluation of the closeness in the size and degree of financial development by estimating the correlation of Central Bank Assets/GDP ratios across the WAMZ. Further investigation is the closeness of the association of interest rate spread of the lead economy (Nigeria) and other WAMZ economies. Data employed in this financial integration assessment span between 1980 and 2015.

Results and Findings: Coefficients of variation of domestic credit granted by WAMZ's deposit money banks in the pre-convergence and the convergence periods are exhibited in Table 4.25 below and expressed in diagrammatic forms in Figure 4.14 below. The variations during the convergence period reflects patterns far away from divergences unlike what is apparent in the pre-convergence era. The degree of convergence during the convergence period is an indication of greater degree of financial integration of these bank-based economies.

[87] Coefficient of variation is specifically useful in making comparison of economic performance and economic indicators over different and same period in more meaningful ways in determining the magnitude of dispersion. A less dispersed variable is depicted by a small coefficient of variation, unlike the variable with larger coefficient of variation.

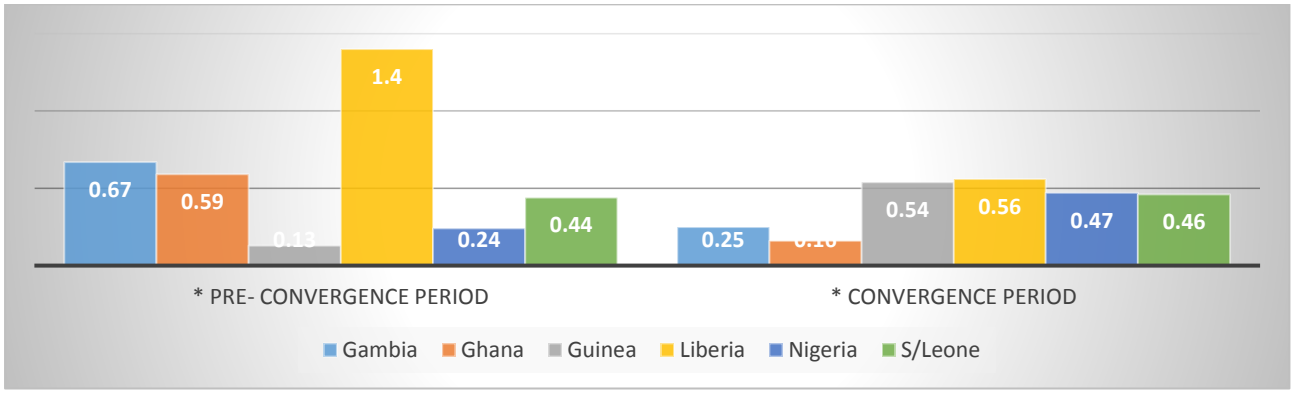
Table 4.25: Coefficient of Variation of Domestic Credit Granted by WAMZ Banks (Pre-Convergence Criteria and Convergence Periods)

	Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*S/Leone*
* Pre- convergence period	0.67	0.59	0.13	1.40	0.24	0.44
* Convergence period	0.25	0.16	0.54	0.56	0.47	0.46

Source: IMF and EIU Databases and Author's Estimations.

Note: The Domestic Credit Growth average estimations cover the 5-year period between 2010 and 2014. Data for the Pre Convergence Period for Liberia span from 1980 to 1989 and 1991 t0 1999, while for Guinea they span from 1989 to 1999. For the Convergence Period, data for The Gambia s0pan from 2000 to 2014.

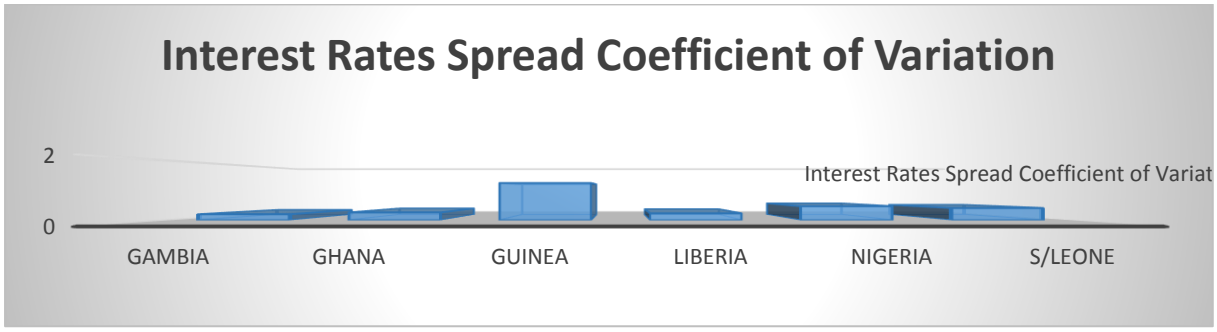
Figure 4.14: Plot of Coefficients of Variation of Credit Granted by the WAMZ Countries



Source: World Bank Database and Author's Estimation

In Figure 4.15 below showing the plot of the coefficients of variation of interest rate spreads across the WAMZ, there are convergence and close similarities in the pattern of variation in this money market indicator, apart from the pattern exhibited by Guinea.

Figure 4.15: Plot of Interest Rates Spread Coefficients of Variation for the WAMZ Countries



Source: World Bank Database and Author's Estimation

In spite of the earlier results of financial systems evaluation, the outcome of further tests of financial system convergence in the degree of association between interest rates spread of the lead economy, Nigeria and those of the five other economies of the WAMZ economies are displayed in Table 4.26 below.

Table 4.26: Correlation of WAMZ Countries' Interest Rates Spread and Nigeria's Interest Rates Spread

WAMZ Country	Correlation with Nigeria's Interest Rate Spread
The Gambia	0.52
Ghana	0.69
Guinea	0.69
Liberia	0.45
Sierra Leone	0.57

Source: IMF and EIU Databases and Author's Estimations.

The results reveal positive association above average in the cases of the WAMZ countries, except Liberia with 45% degree of association with the lead economy. These reasonably demonstrate supports for financial integration as supported by LOOP. When evidence of financial system integration was sought for from the viewpoint of financial development and size, the revelation from the results of the correlation tests of central bank assets (scaled by GDP) is displayed in Table 4.27 below. The results of these correlation tests are mixed. There were negative correlation in association of other WAMZ countries with Guinea. There high degree of positive association in the association between the lead economy, Nigeria and Ghana and Sierra Leone, just as Sierra Leone has further above-average degree positive correlation with all economies of the WAMZ except with Guinea. Though, with the lack of uniformity in the coefficients generated, results of the tests easily reveal that Guinea is the odd-one out of all in financial integration of the WAMZ, while The Gambia is negatively correlated weakly with the lead economy.

Table 4.27: Correlation Matrix of WAMZ Countries' Central Bank Assets/GDP Ratio

	Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*S/Leone*
Gambia	1.00					
Ghana	0.21	1.00				
Guinea	-0.58	-0.22	1.00			
Liberia	0.84	0.48	-0.58	1.00		
Nigeria	-0.06	0.85	-0.16	0.23	1.00	
S/Leone	0.57	0.84	-0.28	0.68	0.73	1.00

Source: Author's Computation, Eviews Output and EIU Database

These results above suggest that central banks across the WAMZ lacks uniformity in the determination of financial system development, thus depicting absence of the desired degree

of financial system convergence which is necessary because of the significant effects and influence of central banks in managing economic growth through the regulation of money and bank lending.

4.8 Factor Market Flexibility

This study proxy factor flexibility by labour market flexibility, which is the labour ability and willingness to respond to market condition changes. For a monetary union, this is vital in the evaluation of how labour market operates in adjusting supply to demand. Labour market (being part of the supply side of the economy) is very crucial to the overall achievement of macroeconomic objectives. 'Effective functioning of labour market' is what labour market flexibility stands for. A low degree of labour market flexibility can be costly for members of a monetary union characterised by this because of the absence of an independent monetary policy to serve as adjustment mechanism whenever there are economic shocks. What an efficient and flexible labour markets imply for members of a monetary union is higher level of employment which by logical interpretation reflects that the lower the official long term unemployment rate of a member country, the greater the country's labour flexibility and on the other hand, the higher the long term unemployment rate, the higher the degree of labour rigidity. This study deviates from other studies by determining factor flexibility from the view-point of labour rigidity in member countries.

Data and Methods: The estimation of factor flexibility in this research applied annual data of unemployment rate as percentage of total labour forces across the WAMZ, spanning over a 25-year period between 1991 and 2015, sourced from the EIU database. This is in addition to the use of the secondary data on labour freedom constructed by the Heritage Foundation and collected for this study over a 5-year period from 2011 to 2015. The computation of the index of degree of labour freedom applied six equally weighted quantitative factors which are: (i) ratio of minimum wage to average value added per worker; (ii) hindrance to hiring additional

workers; (iii) rigidity of labour hours; (iv) difficulty in firing redundant employer; (v) legally mandated notice period; and (vi) mandatory severance pay. Each of these factors is converted to scale of 0 to 100 based on the equation:

$$Factor\ Score_i = 50\ X\left(\frac{factor\ average_i}{factor_i}\right). \quad 4.13$$

This reflects the calculation of factor score of country relative to world's average and multiplied by 50. For each country, the scores for the six factors are averaged to yield the labour freedom index. From this point, 'compact' coefficients of labour rigidity for the WAMZ countries were derived by estimating the deviation from 1, of the reciprocal of the indices of degree of freedom multiplied by 100 thus:

$$LR_i = \left(\frac{1}{f}\ X100\right) - 1 \quad 4.14$$

Where LR_i is the coefficient of labour rigidity for country i, f is the index of degree of labour freedom. The farther away from zero of the labour rigidity coefficient, the lower the degree of labour rigidity and the closer to zero the labour rigidity coefficient, the higher the degree of labour flexibility.

Results and Findings: Information from the Heritage Foundation (2015) about the nature of labour markets in the WAMZ are revealed in Table 4.28 below.

Three-year moving averages for five period as well as the 25-year averages of unemployment rates scaled over the total labour force is presented in Table 4.29 and diagrammatically represented in Figure 4.15 below. The Gambia had the highest periodic unemployment moving averages all through while Sierra Leone recorded the lowest of these over the periods.

Table 4.28: Nature of Labour Markets in the WAMZ

WAMZ Country	*Nature of Labour Market*
The Gambia	Labour regulations have become more flexible, but the labour market remains stagnant. Although there is a shortage of skilled labour, the economy is burdened with high unemployment as well as underemployment.
Ghana	Labour regulations remain restrictive and outmoded. The non-salary cost of employing a worker is moderate, but dismissing an employee is costly and difficult.
Guinea	Employment regulations are flexible, although enforcement is not effective. The non-salary cost of employing a worker is moderate, but dismissing an employee can be difficult and costly. The formal labour market remains underdeveloped.
Liberia	With a labour market dysfunctional, about 80 percent of the workforce is engaged in the informal sector. Labour regulations are rigid. The non-salary cost of employing a worker is high, and dismissing an employee is relatively costly.
Nigeria	Labour regulations are relatively flexible, but much of its labour force is employed in the public or energy sectors. In the absence of dynamic non-energy growth, a more vibrant labour market has not yet emerged.
Sierra Leone	The labour market lacks the capacity to facilitate dynamic employment growth. Labour regulations, outmoded and inflexible, are rather futile in application, as much of the country's labour force is employed in the informal sector.

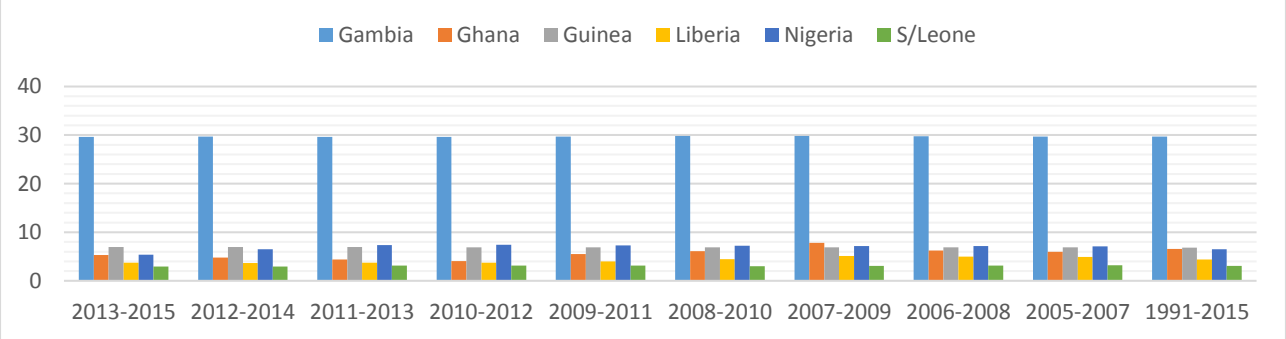
Source: The Heritage Foundation and Wall Street Journal

Table 4.29: Unemployment Rate as Percentage of Total Labour Force (25-year Average and 3-year Moving Averages)

	Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*S/Leone*
2013-2015	29.63	5.29	6.94	3.74	5.39	2.91
2012-2014	29.69	4.81	6.94	3.69	6.50	2.96
2011-2013	29.62	4.42	6.93	3.72	7.34	3.13
2010-2012	29.65	4.09	6.90	3.71	7.41	3.15
2009-2011	29.67	5.54	6.89	4.01	7.29	3.11
2008-2010	29.82	6.07	6.90	4.48	7.24	3.02
2007-2009	29.81	7.82	6.90	5.11	7.19	3.06
2006-2008	29.77	6.21	6.90	4.96	7.15	3.12
2005-2007	29.72	5.99	6.87	4.90	7.10	3.21
1991-2015	29.67	6.54	6.84	4.36	6.47	3.06

Source: World Bank's WDI (ILO Modelled Estimates) and Author's Calculations.

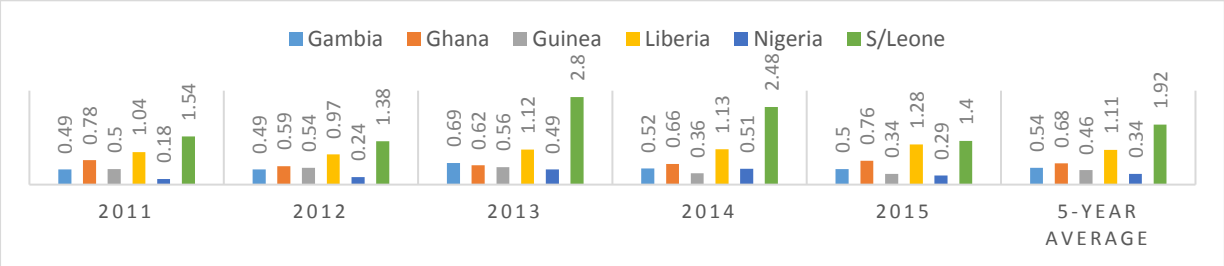
Figure 4.16: Plot of Unemployment Rate as Percentage of Total Labour Force (25-year Average and 3-year Moving Averages)



Source: World Bank's WDI (ILO Modelled Estimates) and Author's Calculations.

By simple inference, The Gambia, having the highest rate hovering around 30s can be regarded as recoding the lowest degree of labour factor flexibility across the WAMZ. And failed to fulfil this OCA criterion. For monetary integration of the WAMZ based on this test of factor market flexibility, Sierra Leone with the lowest averages of unemployment rates can be regarded as the best fit of all four countries that record single digit averages (Ghana, Guinea, Liberia and Nigeria). The results of further evaluation of the factor market flexibility from the viewpoint of labour rigidity is exhibited in Figure 4.17 below which shows the calculated annual coefficients of degree of labour rigidity and the related 5-year average. This is a result that put some factors into play.

Figure 4.17: Plots of Labour Market Rigidity in the WAMZ (2011-2015)



Source: World Bank's WDI (ILO Modelled Estimates), Heritage Foundation and Author's Calculations.

All through the analysis over the estimation period (including the 5-year average), Sierra Leone displays the most labour rigid economy in the WAMZ which makes the country not to be a good candidate for the WAMZ's monetary integration due to what this suggest for factor market flexibility. The lead economy of the WAMZ, Nigeria has the lowest degree of labour market rigidity over the period covered by the assessment. This is positive for the proposed monetary union.

4.9 Results of Related Empirical Studies on OCA Perspectives of WAMZ Monetary Integration

From the perspectives of the properties of OCA, a few number of empirical studies have evaluated the feasibility of the monetary integration of the WAMZ as well as the viability of the membership of the proposed monetary union for prospective member countries. Findings and results of some of these empirical researches are discussed in this section. An evaluation of the economic rationale for monetary union in Sub-Saharan Africa was performed by Benassy-Quere and Coupet (2003) through the use of cluster analyses of a sample of 17 countries by adapting variables emanating from the OCA theory (and the fear-of-floating literature) to conclude that the creation of the WAMZ around Nigeria is not supported by data. The result however, supported the inclusion of The Gambia, Ghana and Sierra Leone in an extended WAEMU arrangement or creation of a separate monetary union with the 'core' of the WAEMU and The Gambia. Further to this study by Benassy-Quere and Coupet (2003), Bankage (2008) used the methodology initiated by Bayoumi and Eichengreen (1997) to compute OCA indices for 21 African countries. This study got a high-predicted volatility for Nigeria in relation to other ECOWAS countries, leading to the suggestion that the inclusion of Nigeria in the WAMZ (and in the extended WAEMU) is not suitable according to the OCA theory. Cham (2011) assessed the feasibility of the WAMZ as a monetary zone using the combination of both macroeconomic convergence and the OCA properties (openness, shock synchronisation and labour mobility) to gather evidence towards concluding that the degree of labour mobility is low, shocks were not synchronised and the degree of openness of members (apart from The Gambia and Nigeria) were below average. Omotor and Niringiye (2011) used simple bivariate of vector autoregressive model to assess WAMZ's feasibility as an OCA from the perspective of economic shocks and got results suggesting that the WAMZ is feasible to form an OCA. Coleman (2011) investigated business cycle synchronisation in

five member countries of the WAMZ (The Gambia, Ghana, Guinea, Nigeria and Sierra Leone) applying Pearson correlation of trend and cyclical component of GDP to investigate co-movements at high frequencies between computed Z-scores for pairings of the five candidate countries. The results indicated lack of a consistent pattern of synchronised growth cycles, which raised concerns over economic sustainability of the WAMZ. With the application of cointegration and fractional cointegration methods, inflation dynamics and common tendencies of real GDP of the WAMZ countries were investigated by Alagidede et al. (2012) to gather evidence of substantial heterogeneities in these respects, across the WAMZ. Raji (2012) applied dynamic GMM and cross country correlation to assessed the real exchange rate misalignments and economic performance of the WAMZ to determine the implications of these for economic unionisation of the WAMZ to conclude that the WAMZ experiences asymmetrical correlations between real exchange rate misalignments and economic performances. The cross-country correlation test however revealed moderate degree of symmetrical relationship using some macroeconomic variables such as real exchange rate, misaligned real exchange rate, openness, inflation and output. Costs and benefits of a common currency in the WAMZ were estimated by Okafor (2013) by means of behavioural models to capture costs elements (asymmetric shocks, loss of monetary autonomy, fiscal distortion) and benefits (trade creation, financial integration effects and policy coordination gain) to yield evidences towards suggesting that potential benefits of common currency in the WAMZ will likely be lower than marginal costs due to loss of monetary policy sovereignty which could be monumental in spite of extended trade creation benefits. In a correlation investigation of structural shocks across the WAMZ, Harvey and Cushing (2015) concluded that the WAMZ countries responded asymmetrically to common supply, demand and monetary shocks and so, will respond differently to a common monetary policy. Assessments of the extent of convergence and business cycle synchronisation of

business cycles within the WAMZ was performed by Alagidede and Tweneboah (2015) in the analyses of growth rate convergence. The results gathered suggested dissimilarities in business cycles within the WAMZ. Analyses of trade within the WAMZ and WAMZ's trade with other countries with West Africa, Europe and Asia were made by Mensah (2016) who found strong evidence against trade symmetry in the WAMZ as well as some evidences of marginal convergence in inflation, real GDP growth and monetary policy rate, with reasons to infer that partial convergence in the WAMZ as well as significantly low trade within the WAMZ and the WAMZ countries with outside world.

Results and evidences generated by most of the studies discussed above are in tune with those yielded by this thesis in the specific analyses of business cycle synchronisation, trade openness, inflation and labour mobility. However, this thesis did not embark on shock assessment of the WAMZ.

4.10 Conclusions

This chapter evaluated the feasibility of the monetary integration of the WAMZ from the perspectives of seven properties of the OCA theory, applying various statistical and econometric tools. The analysis of variance assessments of the uniformity of macroeconomic indicators revealed that virtually all these indicators do not have similar features across the WAMZ. The test of equality of economic dynamics performed with Theil Coefficient of Inequality method revealed Nigeria as having the strongest degree of equality of her economy with the WAMZ's aggregate economy in terms of economic dynamics. However, in this same respect, when the aggregate economy of the WAMZ without Nigeria was evaluated, Ghana exhibited the strongest equality while other four economies had high degrees of inequality. What these denote is that in terms of economic dynamics of the whole WAMZ, Nigeria stands the only country that hugely share similarities with the WAMZ, while Ghana has same feature in a WAMZ without Nigeria. The business cycle analysis of the monetary

integration feasibility produced evidences suggesting that the extent of business cycle synchronicity was low particularly during the pre-convergence period. The results for the convergence period were much better. Investigations here, on the overall, suggest unsynchronised business cycles across the WAMZ. The study of inflation revealed improved and better similarities during the convergence era. Generally, the inflation deviation and the correlation analyses reveal that The Gambia is the most country feasible for the exchange rate fixation with the euro and the US dollars. Nigeria, the lead economy yielded unfavourable results in the inflation evaluation. The assessment of the time series properties of inflation produced evidences to suggest permanent and long-lasting effects of inflation rate and that the cost implications of disinflationary measures in a common monetary policy may be high since the future inflation may be unpredictable within the zone. The evaluation of production structures in the WAMZ brought the conclusion of huge similarities in production structures, significantly in the last six years of the period covered by this study. This outcome is in favour of a common monetary policy in attending to economic disturbances in the proposed monetary zone. The assessment of the openness of the WAMZ countries to trade revealed Liberia as the most opened, while other countries demonstrated close similarities in this respect. However, the intra-region bilateral trade openness between the two strong economies of the WAMZ adds positive values to the feasibility of the WAMZ's monetary integration. Nevertheless, the low degrees of openness of the lead economy (Nigeria) gives concerns. Nigeria recorded the lowest degree of openness all through. In the evaluation of financial integration and financial system convergence, the results were mixed. The tests of correlation of Nigeria bank-based financial system with the five smaller bank-based financial markets showed positive association. However, the evaluation of WAMZ's central banks revealed lack of financial systems convergence and lack uniformity in WAMZ's central banking attitudes. This is a key factor for determining financial development within the proposed

currency area. The factor market mobility as measured by labour mobility shows that Nigeria is the most labour flexible of the WAMZ countries. From the theoretical proposition, this has good implications for the proposed monetary zone. Other WAMZ countries are reasonably flexible apart from Sierra Leone that exhibited a high degree of labour rigidity.

Given the mixed results derived from the various assessments of the seven properties of the OCA and some poor results yielded by the lead economy (apart from the evidence from labour mobility and economic dynamics analyses), on the overall, it can be infer from this chapter that the WAMZ may not be an optimum currency area for now, except efforts are intensified is those weak areas.

Chapter 5

Monetary Perspectives

5.1 Introduction

The essence of money and monetary policy in a monetary union necessitates the evaluation of the feasibility of monetary integration of a geographic bloc from monetary perspectives. The evaluation of some monetary subject-matters within the monetary union is crucial and pivotal because common currency will be in use on the take-off of such monetary union, and money supply is expected to play a role in influencing real and nominal macroeconomic variables in such union. Going by the notion of the OCA, the success of a proposed currency area is positively assured and the monetary union could adjudged feasible if there are high degrees of similarities in operation of monetary policies as well as how macroeconomic fundamentals relate with and affect monetary policy instruments in member countries. Such feasibility is equally guaranteed if the scale of ease of monetary integration of the member countries are high and if the expected single monetary policy would be suitable for national stability of member countries that are expected to lose their respective monetary independence on the commencement of the monetary union and the establishment of a common central bank which would formulate the common monetary policy for the proposed monetary union. The WAMZ proposing to be a monetary union equally deserve such feasibility assessments in aspects relating to money and monetary policy. One other factor of significance is the interactions of monetary policy with fiscal policy in monetary integration. This is due to the need to achieve price stability (in the proposed inflation targeting terrain) while the two policies (fiscal and monetary) will be in the hands of two separate sets of policy makers.

Therefore, in drawing appropriate inferences on the feasibility of the monetary integration plans of the WAMZ, answers are provided by this research study, to questions that pertain to: (i) if money is neutral (or super-neutral) in the WAMZ; (ii) if monetary dominance is prevailing across the WAMZ; (iii) if the nature and patterns of monetary reactions of the WAMZ countries are similar enough to guarantee a feasible monetary integration of the WAMZ countries; (iv) the extent of expected loss of monetary policy independence in the case of each prospective WAMZ member states; and (v) the degree of suitability of the expected common monetary policy for member countries of the WAMZ. Answers to these question provide some unique contributions to existing studies on the WAMZ as a future monetary union, and these question are necessarily valuable in answering the major research question of this thesis.

5.2 Money Neutrality

One of the many ways through which the effectiveness of monetary policies could be measured is to check the neutrality of money in the economy. A basic issue in macroeconomics is the possible link between nominal variables (measured in monetary terms) and real variables. A fundamental issue here is whether money has real influence or effects. Money neutrality is about what the long run relationship between money and price imply for the use of monetary aggregates in the conduct of monetary policy. The argument is that if a single monetary policy is prevalent in a monetary union, it is significant that members of such monetary integration should exhibit similarities in behaviour of money. The main research questions answered in this section were: is money neutral and super-neutral across the WAMZ? Does money supply affect real macroeconomic variable? Answers to the question are essential as evidence require to draw inferences on the suitability of a common monetary policy for the WAMZ countries.

5.2.1 Theory and Model

Monetary neutrality as a concept of classical economics, generally suggests that within an economy, changes in a nominal variable (like money supply) do not impact a real variable (like real GDP and employment). There are two hypotheses that explain the real/nominal variable relationship which specify that in the long run: (i) permanent change in the level of money supply has no effect on the level of real variable (this is money neutrality hypothesis); (ii) a permanent change in the growth rate of money supply does not influence the level of real variables (this is money super-neutrality hypothesis). The generally accepted of the two hypotheses is first one which is the long run money neutrality (LMN) proposition. The reason for this acceptance is that apart from standing as a core feature of a huge number of economic models, LMN is the yardstick for monetary policy effectiveness measurement.

Over the decades and centuries, across nations and economies with varied monetary and fiscal policies, literature have been able to establish the monetarists argument in favour of the significance of monetary aggregate in strategising the control of inflation through the robust empirical estimations of low frequency or long run association of money growth and inflation. The dictum of Milton Friedman is that 'inflation is always and every time a monetary phenomenon'. Therefore, the underlying view of the quantity theory of money that portrays money as the determinant of inflation rate, thus makes inflation control (maintenance of price stability) as obvious and necessary major objective of a central bank. The popular thinking (right from elementary levels) is that a monetary policy that aims at inflation control should bother itself with how modest rate of money supply growth can be maintained. Though, many academic and policymakers are of the view that money does not play a role in the conduct of monetary policy, many schools of thoughts however disagree with this issue of de-emphasising money and money growth as a criteria for assessing how sound a monetary policy. A bothering question is if monetary policy decisions can be based

on the models of monetary policy transmission mechanism which fail to take cognisance of the monetary aggregate. [88]

The fundamental principles of 'neutrality of money' (as an economic theory), cast doubts over the theoretical coherence of the 'money-less' monetary policy models (which apparently lacks consistency with the fundamentals of money neutrality'. Woodford (2007) stresses that a model that makes reference to money neutrality (or which leaves the general price level to be indeterminate) should be applied in predicting the consequences of alternative policies for inflation. Monetary economists hold the view that injections of money into an economy have certain implications because such change in money stock will only change nominal wages and price without any reflection of such change in real output, real wages and real interest rates. The effect of the injection of money into the macro economy is neutral on the long run because most macroeconomic decisions emanate from real factors within the economy; and consequently, there would be no change in economic decisions made because the real variables are unchanged. This is why neutrality of money is a postulation that a change in the stock of money within an economy, affects just only nominal variables, with no such effect on real variables that are inflation-adjusted. Therefore, what money neutrality idea imply is that the central bank does not affect the real economy (size of the GDP, employment, real investment and real consumption) by printing money; and that any increase in money supply would be negated by a proportional rise in price and wages. This is an assumption underlying some macroeconomic theories and models (like the classical model, neo classical model, real business cycle theory).[89]

[88] The ECB, the common central bank of the EMU always asserts prominent and significant roles of growth in money supply within the context of the formulation and of monetary policy strategy.
[89] These theories and models all show that money is neutral and has no effect on real variables within the economy

According to the 'classical dichotomy', there are different powers having different effects on nominal and real variables, thus causing money supply to affect only nominal variables. When the velocity of money is constant while the capacity to supply good constrains the velocity of activity, money supply changes will cause price changes.[90] New classical economists posit that even in the short term, perfectly anticipated monetary policy cannot affect activity, thus supporting the classical concept of long run money neutrality. As a long-run proposition, the classical dichotomy was basic to the views of many pre-Keynesian economists (regarding money as a veil) just as the new classical macroeconomic theories. Based on the argument that prices are sticky, the classical dichotomy was rejected by the Keynesians and the monetarists. Their thinking was that prices fail to adjust in the short run, so that money supply increase will cause aggregate demand to rise and thereby altering real macroeconomic variables. The view in classical economics and neoclassical economics tends towards the notion that as monetary factors (and not real factors) wholly determine nominal variables, real factors (not monetary factors) purely determine real variables in the economy. Keynesian and monetarist economists however rejected this position.[91]

Woodford (2007) points out what the long run relationship between money growth and prices imply for monetary policy conduct. Firstly, with the existence of the well-established empirical relationship, 'money-less' models of inflation are impliedly incorrect. Secondly, the long run money-price relationship provides the basis for the argument on the desirability of a money-growth target. Thirdly, with the cointegration of money growth and inflation rate, one would not need further information in order to forecast average inflation rate over some sufficiently long future horizon since one would already possess the knowledge of what the average rate of money growth will be over such time horizon. These justify the significance

[90]This led Friedman to conclude that "inflation is always and everywhere a monetary phenomenon."
[91]This rejection is based on prices sticky prices arguments that: if prices fail to adjust in the short run, an increase in the money supply raises aggregate demand and thus alters real macroeconomic variables (Oxford Dictionary Quick reference)

of this study on money neutrality and superneutrality for the assessment of monetary integration of the WAMZ, while providing answers to the question on if money matters within the proposed monetary zone.

5.2.2 Data and Methods

For a detailed investigation of long run money neutrality (LMN) and due to the evidence that monetary neutrality tests are sensitive to the underlying monetary aggregates, quasi money which has properties resembling M1 money was applied for money supply. Given the developing nature of the economy of WAMZ countries in which a high proportion of base money does not pass through the formal banking system, there is justification in laying greater emphasis on results generated for the assessment of cointegrating relationships between real output and M1(which includes physical cash in circulation) in the WAMZ countries. The real variables are real output as proxy by real GDP and inflation (as measured by GDP deflator). Annual data collected for the six WAMZ countries for the purpose of this study span over the period between 1980 and 2014. All the variables are expressed in logarithmic transformations.

The autoregressive distributed lag (ARDL) bound testing approach developed by Pesaran et al (2001) was employed to test money neutrality and money superneutrality here. As opposed to the traditional Engle-Granger and Johansen cointegration approaches, the ARDL bound testing cointegration method is very rare in the investigation of neutrality of money. While attention was paid to the integration and cointegration properties of the variables and unit root tests of the variables were performed in order to assess the stationary properties of the variables. Since the long run relationship between the money stock and real output depends on the integration order of each variable, the Dickey-Fuller GLS (DF-GLS) and Phillips-Perron (PP) unit roots tests were applied so as to establish that none of the variables is I(2) and thus avoid spurious results. The assumption of bound test is that variable employed in the

estimation are I(0) or I(1), thus making the Pesaran F-statistics based on I(2) variables to be invalid. ARDL bounds test cointegration procedure enables the empirical analysis of long run relationship and dynamic interactions between variables of interest. This is a procedure developed by Pesaran, Shin and Smith (2001). An ARDL regression model, in its basic form, is stated as:

$$y_t = \beta_0 + \beta_1 y_{t-1} + \cdots + \beta_k y_{t-p} + \alpha_0 x_t + \alpha_1 x_{t-1} + \alpha_2 x_{t-2} + \cdots \alpha_q x_{t-q} + \varepsilon_t \qquad 5.1$$

The lag lengths of both the dependent and independent variables should be carefully determined. In the ARDL modeling, the x terms on the right hand side of the equation is usually referred to as 'q' while the autoregressive lag length of the dependent is usually called 'p'. The most common method of determining the lag lengths in the ARDL process is by information criteria (AIC or BIC). Specifically here, the first stage in the ARDL process in the estimation of money neutrality and superneutrality was to establish if long run relationships exists by applying the unrestricted error correct model (UECM) representation of the ARDL (p,q) thus:

$$\Delta\pi y_t = \alpha_0 + \beta_1 y_{t-1} + \beta_2 lnM_{t-1} + \sum_{i=1}^{p} \delta_i \, \Delta\pi y_{t-i} + \sum_{j=1}^{q} \gamma_i \, \Delta lnM_{t-j} + \varepsilon_t \qquad 5.2$$

Where α_0 is the constant, β_1 and β_2 are long-run relationships parameters, δ_i and γ_i are the short run relationships parameters, Δ is the difference operator and ε_t is the white noise term. Biased coefficient estimates will result when an ARDL model is estimated by ordinary least (OLS) square method. The OLS will also be an *inconsistent* estimator because of the influence of lagged values of the dependent variable as regressors, if the disturbance term, ε_t, is autocorrelated. This is a reason for the general introduction of instrumental variables in the application of an ARDL models. The model is "autoregressive" because of the part explanations of the dependent variable by its own lagged value; and contains a "distributed lag" component with the successive lags of the explanatory variables on the right hand side of

the model. Researchers can efficiently apply the method whether or not the regressors in the model are purely I (0) or I(1), but not I(2). In this ARDL process, the null hypothesis in Equation 5.2 above was expressed as: $H_0 = \beta_1 = \beta_2 = 0$ indicating 'no long run relationship' against the alternative hypothesis:$H_0 \neq \beta_1 \neq \beta_2 \neq 0$, using the F-test. The F-test which has a non-standard distribution was applied on lagged values of the variables in the process of determining the existence of long run relationship among the variables. The F-test is conditional upon: (a) if the variables in the ARDL model are I(0) or I(1); (b) the number of explanatory variables; (c) if the ARDL model contains an intercept and/or a trend.

The evaluation of the estimated value of *F*-statistic were in line with the critical values tabulated in Table CI (iii) of Pesaran *et al.* (2001). Two bounds of critical values are generated here as benchmarks for the integration orders of the variables. The upper bounds values are for the I(1) variables, while the lower bounds values are for the I(0) variables. Cointegration exists if the computed F statistic exceeds the upper critical value. F-statistics below the lower critical value bound indicate that there is no cointegration. The test is inconclusive when the F-statistic fall in-between the two bounds of critical values. This study applied the bound-test small sample size critical value computed by Narayan (2005) rather than the Pesaran and Pesaran (1997) critical values which were computed for large samples sizes of 500 to 1,000 observations. After the long run relationships were established through the bound tests, at the second stage was the estimation of the estimation of the long run and short run coefficients of cointegration. If the null hypothesis of no cointegration is rejected (that is, the cointegration of the variables is ascertained), the long run relationship between the variables would be estimated by setting the error correction component of Equation 5.2 equal to zero to derive the long run effects by normalising β_2 on β_1. Diagnostic test for serial correlation, misspecification of functional form, normality and heteroscedasticity and

parameter stability were performed via CUSUM, CUSUMSQ and other tests on the error correction representation of the ARDL model.

The derivative macroeconomic models applied in this money neutrality and money superneutrality evaluation are as expressed below. For money neutrality:

$$y_t = fm_t \quad 5.3$$

For the two tests money super-neutrality:

$$\%\Delta y_t = f\%\Delta m_t \quad 5.4$$

and

$$\pi_t = f\%\Delta m_t \quad 5.5$$

where y is the real GDP, and m is the quasi money supply, π is inflation and is $\%\Delta m$ money supply growth, all at period t. Taking the natural logarithm of real output and money supply, the investigation of money neutrality and money superneutrality (through the estimations of the relationship between inflation, real output real output growth and money supply aggregates) and explicitly specified in the estimable econometric functions in Equations 5.6 to 5.8.

For the money neutrality tests:

$$lny_t = \alpha + \beta lnm_t + \varepsilon_t \quad 5.6$$

and the following two equations for the money superneutrality tests:

$$\pi_t = \alpha + \beta mg_t + \varepsilon_t \quad 5.7$$

$$yg_t = \alpha + \beta mg_t + \varepsilon_t \quad 5.8$$

where yg_t is output growth rate at time t, and mg_t is money growth rate at time t. It is very likely that the estimates of these 'St. Louis Equations' equations may yield results that would provide evidence of non-neutrality of money, for instance, when a strong association between higher growth in money supply and higher output growth could be established, because of the

positive estimated parameter.[92] As solution to this problem it was necessary to apply a model that will find solution to possible endogenous explanatory variables. This entailed the introduction of instrumental variables which makes the use of ARDL model to be more appropriate.

The augmented ARDL model expressed by Pesaran et al (2001) took the following general form:

$$y_t = \alpha_0 + \sum_{t=1}^{k} \beta_i x_{it} + \varepsilon_t \quad 5.9$$

where y_t is the dependent variable, α_0 is the constant term and x_{it} is the independent variable and ε_t is the disturbance term. In terms of the lagged levels and difference, we can obtained the unrestricted error correction version of (for instance) an ARDL (1,1) model as:

Neutrality with respect to real output:

$$\Delta lny_t = \alpha_o + \sum_{t=1}^{k} \beta_1 \Delta lny_{t-i} + \sum_{t=1}^{k} \beta_2 \Delta lnm_{t-i} + \gamma_1 lny_{t-1} + \gamma_2 lnm_{t-1} + \varepsilon_t \quad 5.10$$

Neutrality with respect to inflation:

$$\pi_t = \alpha_o + \sum_{t=1}^{k} \beta_3 \Delta \pi_{t-1} + \sum_{t=1}^{k} \beta_4 \Delta lnm_{t-i} + \gamma_3 \pi_{t-1} + \gamma_4 lnm_{t-1} + \varepsilon_t \quad 5.11$$

Super-neutrality with respect to real output growth:

$$\Delta yg_t = \alpha_o + \sum_{t=1}^{k} \beta_5 \Delta yg_{t-1} + \sum_{t=1}^{k} \beta_6 \Delta lnm_{t-i} + \gamma_5 yg_{t-1} + \gamma_6 lnm_{t-1} + \varepsilon_t \quad 5.12$$

Super-neutrality with respect to changes in inflation rates:

$$\Delta \pi_t = \alpha_o + \sum_{t=1}^{k} \beta_7 \Delta \pi_{t-1} + \sum_{t=1}^{k} \beta_8 \Delta lnm_{t-i} + \gamma_7 \pi_{t-1} + \gamma_8 lnm_{t-1} + \varepsilon_t \quad 5.13$$

While Equations 5.10 and 5.11 estimated money neutrality, Equations 5.12 and 5.13 estimated money super-neutrality against inflation. All the variables were as defined. β and γ are the parameters of interest to be estimated. The first part of each equations with β_1, β_2, β_3, β_4, β_5, β_6, β_7, and β_8 represent short run dynamics while the second part with γ_1, γ_2 , γ_3, γ_4 γ_5 ,γ_6, γ_7 and γ_8 representing the long run relationships. Δ is the first difference operator and ε_t is the 'while noise error term'. Evaluation made in this study was limited to money

[92] This method was used in the 60s by the St. Louis Fed economists Leonall C. Andersen and Jerry Jordan.

neutrality tests in respect of real output and money superneutrality tests regarding inflation and real output growth. Therefore, the tests of null hypotheses (as against alternative hypotheses) of no long run relationships are:

For Equation 5.10 – $H_0 = \gamma_1 = \gamma_2 = 0$ – no long run relation

For Equation 5.12 – $H_0 = \gamma_5 = \gamma_6 = 0$ – no long run relation

For Equation 5.13 – $H_0 = \gamma_7 = \gamma_8 = 0$ – no long run relation.

The test equation of the unit roots tests of variables of interest (money supply, real output, money supply growth and real growth) performed here included trend and intercept as appropriate. The Schwarz Information Criteria (SIC) was applied for the automatic lag selection in the DF (GLS) tests while for the PP tests, the Newey-West Bandwidth Selection was used for the bandwidth automatic selection and the Bartlett Kernel spectral estimation method was applied. ARDL bounds tests were performed at 5% level of significance with restricted intercept and no trend. In the first test, there was automatic lag length selection by the SIC in which the maximum lag was lag 2 were specified for the dependent and independent variables while lag lengths of both variables were fixed at 1 in the second bounds test.

5.2.3 Results and Findings

The results of the unit roots tests and the decision on the order of integration of the variables employed (money supply and real output) highlighted in the lower part of Table 5.1 below shows that the two macroeconomic variables (money supply and real GDP) for the assessment of money neutrality are integrated to the order of 1. Because none of the variable is integrated to the order of 2, there was the conviction towards the appropriateness of the use of the ARDL method in estimating the neutrality and superneutrality of money in the six WAMZ countries. Tables 5.1 and 5.2 below give the unit roots tests results for the variables employed in the test of money neutrality (super-neutrality) in the WAMZ where it is revealed

that all the variables for money neutrality tests are in same integration order of I(1) while those for superneutrality tests have similar integration of I(0).

Table 5.1: Results of the Unit Roots Tests of the Money Neutrality Assessment Variables

Statistics						
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Money Supply						
DF GLS (Level):	-2.8260	-1.3779	-1.574	-1.6218	-2.3686	-0.8256
DF GLS (1st Difference):	-6.2948	-6.0036	-5.5292	-3.0759	-4.0560	-5.8731
PP (Level):	-3.1980	-1.407	-1.7849	-1.4928	-1.1521	-0.6780
PP (1st Difference):	-11.9039*	-6.0036*	-5.7842*	-3.0076*	-6.4622*	-6.0092*
Real Output						
DF GLS (Level):	-2.2875	-0.7776	-2.4399	-1.2213	-2.0853	-0.9567
DF GLS (1st Difference):	-5.2149	-5.1525	-5.3009	-5.5173	-4.1206	-4.7293
PP (Level):	-1.8319	-0.4961	-2.3606	-2.2905	-2.7227	-0.8654
PP (1st Difference):	-5.3142*	-4.9935*	-5.5735*	-11.1693*	-4.2442*	-5.0421*
Implications						
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Money Supply						
DF GLS (Level):	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
DF GLS (1st Difference):	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
PP (Level):	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
PP (1st Difference):	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
Real Output						
DF GLS (Level):	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
DF GLS (1st Difference):	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
PP (Level):	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
PP (1st Difference):	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)

Source: Author's Estimation and EViews 9 Output

Note: For the unit roots tests *, ** and *** denote 1%, 5% and 10% levels of significance respectively.

Table 5.2: Results of the Unit Roots Tests of the Money Super-Neutrality Assessment Variables

Statistics						
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Money Supply:						
DF GLS (Level):	-4.6849*	-4.7485*	-5.4078*	-4.7389*	-3.4883*	-3.9960*
PP (Level):	-4.9827*	-4.7991*	-5.5721*	-4.9473*	-4.3864*	-4.6980*
Real Output Growth:	4.8408*	5.4106*	2.2455**	-3.0757*	-2.0476**	-5.4192*
DF GLS (Level):	-8.1234*	-5.3272*	-5.9124*	-3.0076*	-5.6214*	-5.5394*
PP (Level						-
Inflation:						
DF GLS (Level):	-5.179*	-3.9765*	2.4179**	-4.1326*	-5.666*	2.7938*
PP (Level):	-5.2370	-5.5849	-2.746***	-4.1231*	-5.6379*	-2.508***
DF GLS (Diff.):			-5.7402*			-4.7391*
PP (Diff.):			-6.2360*			12.4090*
Implications						
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Money Supply:						
DF GLS (Level):	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)
PP (Level):	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)
Real Output:						
DF GLS (Level):	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)
PP (Level):	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)
Inflation:						
DF GLS (Level):	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)
PP (Level):	I(0)	I(0)	I(0)	I(0)	I(0)	I(0)

Source: Author's Estimation and EViews 9 Output

Note: For the unit roots tests, *, ** and *** denote 1%, 5% and 10% levels of significance respectively.

Discussions of the Results of Money Neutrality Tests: The results of the SC automatic lag selection ARDL models estimations of money neutrality in of WAMZ economies in Table 5.3 below reveal that the F-statistics exceed the upper bounds in the cases of The Gambia, Ghana, Guinea, Nigeria and Sierra Leone under the two ARDL bounds tests showing that at 1%, 2.5%, 5% and 10% significance levels, therefore, we could not accept the null hypothesis of no cointegration (and long-run relationships) between real output and money supply in these five WAMZ countries.

Table 5.3: Results of the ARDL Bound Tests of Money Neutrality with Respect to Real Output in the WAMZ (1980-2014)

Schwarz Criterion Automatic Lag Selection ARDL Model		
	F-statistics	*Cointegration (at 95% Confidence Level)*
The Gambia (ARDL 1,0)	43.4056	Yes: Reject null hypothesis
Ghana (ARDL 1,0)	63.7130	Yes: Reject null hypothesis
Guinea (ARDL 1,2)	5.2423	Yes: Reject null hypothesis
Liberia (ARDL 1,0)	3.3566	No: Accept null hypothesis
Nigeria (ARDL 2,0)	5.5360	Yes: Reject null hypothesis
S/Leone (ARDL 1,0)	29.0469	Yes: Reject null hypothesis
Fixed Lag Selection ARDL (1,1) Model		
	F-statistics	*Cointegration (at 95% Confidence Level)*
The Gambia ARDL (1,1)	22.4078	Yes: Reject null hypothesis
Ghana ARDL (1,1)	33.1111	Yes: Reject null hypothesis
Guinea ARDL (1,1)	3.5385	No: Accept null hypothesis
Liberia ARDL (1,1)	3.5194	No: Accept null hypothesis
Nigeria ARDL (1,1)	22.2421	Yes: Reject null hypothesis
S/Leone ARDL (1,1)	26.7385	Yes: Reject null hypothesis

ARDL Critical Values Bounds				
Bounds	***1%***	***2.5%***	***5%***	***10%***
Lower Bound	4.94	4.18	3.62	3.02
Upper Bound	5.58	4.79	4.16	3.51

Source: Author's Estimation and EViews 9 Output

It is consequently evident that apart from Liberia (in which money is neutral), there are no empirical evidences and proof of money neutrality in The Gambia, Ghana, Guinea, Nigeria and Sierra Leone. Liberia recorded the lowest coefficients of F-statistics of joint significance. What these connote is that the proposed common central bank for the WAMZ can affect the real side of the economy (real output, consumption, unemployment etc.) as well as the nominal side of the economy (exchange rate, price, wages etc.) with the level of money supply in these WAMZ (apart from Liberia) because the equilibrium values of variables in the real side of the economies of these countries are independent of money supply. Furthermore, the results of the estimation of the parsimonious fixed lag selection ARDL (1,1) model for the six WAMZ countries (as revealed in the lower component of Table 5.3) reveal money neutrality in Guinea and Liberia, implying that in these two countries, money supply does not have influence on the real variables and consequently, the printing of more money would not cause the effect on the real economic activities of the two WAMZ countries. This

is because the proportional increase in the nominal side of the economy of the country will offset money supply increase that may be put in place.

Table 5.4: Coefficients of Long Run Relationship and Error-Correction in Money Neutrality

Schwarz Criterion Automatic Lag Selection ARDL Model						
Dependent Variable: Real Output						
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Money Supply	5.0085*	2.3975	5.8342*	1.8609	5.1086*	0.9083
(Long Run Coefficient)	(0.2921)	(8.8301)	(1.1809)	(4.0640)	(1.0890)	(10.1573)
Error Correction Term	-0.1498*	-0.0162*	-0.2663*	0.0236*	-0.0485*	-0.0144*
(Coint. Coefficient)	(0.0177)	(0.0016)	(0.0640)	(0.0070)	(0.0129)	(0.0016)
Fixed Lag Selection ARDL (1,1) Model						
Dependent Variable: Real Output						
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Money Supply	4.8670*	2.7590	6.0484*	1.2948	-29.8040	1.4991
(Long Run Coefficient)	(0.3984)	(8.5242)	(1.4936)	(2.998)	(968.694)	(10.6138)
Error Correction Term	-0.1376*	-0.0171*	-0.2197*	0.0291*	0.0017*	-0.0143*
(Coint. Coefficient)	(0.0016)	(0.0016)	(0.0644)	(0.0087)	(0.0002)	(0.0015)

Source: Author's Estimation and EViews 9 Output
Note: The standard errors are in parenthesis.

Table 5.4 above shows the coefficients of the long run relationship and error correction terms in the ARDL models estimations. For the SIC lag selection ARDL model, the coefficients of long-run relationship which are positive for all the WAMZ countries are only significant at 5% level of significance only for The Gambia, Guinea and Nigeria in which there are implied long run relationship. Only The Gambia and Guinea exhibit significant long run relationship in the estimated fixed lag model. For the error correction model of short run relationship estimation results of the SIC lag selection model, all the estimation coefficients are significant at 5% level and are negative as expected except for Liberia at 0.0236. The Gambia and Guinea exhibit significant long run relationship in the fixed lag ARDL model. Only Nigeria displays negative long run coefficient of -29.80. The short run relationship estimation results show that with the SIC automatic lag selection ARDL model, all the coefficient are significant at 5% level and are negative (as expected) except for the positive figures yielded by Liberia and Nigeria for 0.029 and 0.0017 respectively.

For the assessment of money neutrality ARDL model discussed above, the outcome of the three diagnostic tests for normality, serial correlation and heteroscedasticity of the residuals are given in Table 5.5 below. For the SC automatic lag selection model estimations, the assumption of normality of the residual holds for all the WAMZ countries (except for Ghana) where the Jarque-Bera (JB) statistics are insignificant at 5% level of significance at which we could not reject the null hypothesis of normality.

Table 5.5: Results of Post-Estimation Diagnostic Tests for Monetary Neutrality ARDL Model Estimations

Schwarz Criterion Automatic Lag Selection ARDL Model						
Tests	***Gambia***	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
JB Statistics for Normality	1.4925 (0.4741)	6.4186 (0.0404)	0.5742 (0.7504)	4.2141 (0.1216)	0.3251 (0.8499)	4.2072 (0.1220)
Breusch-Godfrey Serial Correlation LM	0.0036 (0.9524)	0.3253 (0.5727)	5.0197 (0.0372)	0.3701 (0.5479)	0.7439 (0.3757)	0.4995 (0.4865)
White Heteroscedasticity	2.0498 (0.1021)	1.6046 (0.1914)	1.6757 (0.1805)	1.9700 (0.1168)	0.8858 (0.5520)	2.6135 (10.0463)
Fixed Lag Selection ARDL (1,1) Model						
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
JB Statistics for Normality	1.8286 (0.4008)	6.9352 (0.0312)	0.2469 (0.8839)	3.9354 (0.1400)	1.0623 (0.5879)	4.3364 (0.1144)
Breusch-Godfrey Serial Correlation LM	0.0069 (0.9344)	0.3340 (0.5661)	1.5235 (0.2314)	0.1833 (0.6720)	2.5933 (0.1181)	0.4352 (0.5147)
White Heteroscedasticity	0.3541 (0.9458)	0.9103 (0.5324)	2.3788 (0.0720)	1.7390 (0.1393)	0.8309 (0.5949)	1.5433 (0.1895)

Source: Author's Estimation and Eviews 9 Output
Note: The p-values are in parenthesis.

The deviation from normality of the residual may be caused by the presence of outliers in the residual. In the Breusch-Godfrey Serial Correlation test including 2 lags, there is residual autocorrelation in the case of Guinea where the null hypothesis of serial correlation is rejected. For all other WAMZ countries, there is the absence of serial of the disturbance terms. However, for the fixed lag selection model, the null hypothesis of serial correlation could not be rejected for all the WAMZ countries.

Discussions of the Results of the Money Super-neutrality Tests with respect to Inflation:

Results of the ARDL bounds tests of cointegration of inflation rates and money supply

growth results are highlighted in Table 5.6 below for the SC automatic lag selection and the fixed lag selection ARDL models. Because the estimated F-statistics obtained from the tests are I(1), falling outside the upper bound for the all the WAMZ countries at 5% significance level, we rejected the null hypothesis of no cointegrating relationships between inflation and money supply growth rate of all the six WAMZ countries, thus suggesting a long run relationship between these variables in the countries. What these results of the two estimated ARDL model tell us is that for the WAMZ, money is not 'long run super-neutral' across the entire future monetary zone. Consequently, growth in money supply can influence inflation as a real economic variable in the WAMZ, suggesting that with the future single monetary policy, money supply tool can impact the real economy. However, these findings for these West African developing economies faulted the views of the 'classical' and the 'neo-classical' schools of thought. Again, Liberia recorded the lowest coefficients of F-statistics of joint significance in these estimations as established in the earlier results. The coefficients of money supply growth and the error correction terms exhibited in Table 5.7 reveal that only Guinea and Sierra Leone have significant and positive long run coefficients in the two lag selection methods. The ECT coefficients are significant for all the countries at 5% level of significance and all negative as theoretically established.

Table 5.6: Results of ARDL Bound Tests of the Super-Neutrality of Money (Inflation and Money Supply Growth)

Schwarz Criterion Automatic Lag Selection ARDL Model		
	F-statistics	*Cointegration (at 95% Confidence Level)*
The Gambia (ARDL 1,0)	9.756	Yes: Reject null hypothesis
Ghana (ARDL 1,0)	10.1327	Yes: Reject null hypothesis
Guinea (ARDL 1,0)	5.1849	Yes: Reject null hypothesis
Liberia (ARDL 1,0)	4.8911	Yes: Reject null hypothesis
Nigeria (ARDL 1,0)	10.2977	Yes: Reject null hypothesis
S/Leone ARDL 1,0)	20.6803	Yes: Reject null hypothesis
Fixed Lag Selection ARDL (1,1) Model		
	F-statistics	*Cointegration (at 95% Confidence Level)*
The Gambia ARDL (1,1)	9.2182	Yes: Reject null hypothesis
Ghana ARDL (1,1)	9.9146	Yes: Reject null hypothesis
Guinea ARDL (1,1)	8.3989	Yes: Reject null hypothesis
Liberia ARDL (1,1)	4.3911	Yes: Reject null hypothesis
Nigeria ARDL (1,1)	10.0686	Yes: Reject null hypothesis
S/Leone ARDL (1,1)	23.7039	Yes: Reject null hypothesis

ARDL Critical Values Bounds				
Bounds	***1%***	***2.5%***	***5%***	***10%***
Lower Bound	4.94	4.18	3.62	3.02
Upper Bound	5.58	4.79	4.16	3.51

Source: Author's Estimation and Eviews 9 Output

Table 5.7: Coefficients of Long Run Relationship and Error-Correction ARDL Models of Super-Neutrality of Money (Inflation and Money Supply Growth)

Schwarz Criterion Automatic Lag Selection ARDL Model						
Dependent Variable: Inflation						
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Money Supply Growth	-0.4246	-0.1701	0.2142*	0.0073	-0.1021	0.2137***
(Long Run Coefficient)	(0.4773)	(0.1904)	(0.0717)	(0.04231)	(0.2941)	(0.1228)
Error Correction Term	-0.9767*	-0.9433*	-1.8341*	-0.6900*	-1.0261*	-1.4085*
(Coint. Coefficient)	(0.1820)	(0.1673)	(0.4384)	(0.1834)	(0.1808)	(0.1068)
Fixed Lag Selection ARDL (1,1) Model						
Dependent Variable: Inflation						
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Money Supply Growth	-0.8343	-0.1533	0.1441**	-0.0161	-0.0265	0.4548**
(Long Run Coefficient)	(0.6113)	(0.2555)	(0.0574)	(0.0634)	(0.3631)	(0.2035)
Error Correction Term	-0.9465*	-0.9437*	-1.2243*	-0.6882*	-1.0248*	-1.4435*
(Coint. Coefficient)	(0.1739)	(0.1673)	(0.2320)	(0.1824)	(0.4803)	(0.1654)

Source: Author's Estimation and EViews 9 Output

Note: The standard errors are in parenthesis.

The post-estimation diagnostic results in Table 5.8 below reveal that in the SIC automatic lag selection estimations, with the statistical significance of the Jarque-Bera (JB) statistics at 5%

level of significance, we rejected the null hypothesis of normality of the residuals in the ARDL model estimated for the six WAMZ countries, except Sierra Leone. However, there were no evidence of serial correlation in the results generated by the Breusch-Godfrey serial correlation LM tests of all the countries and the null hypothesis that no residual serial correlation could not be rejected as the estimated models generated statistical insignificant coefficients in this test. The White heteroscedasticity tests results suggested that the variance of the error terms differs across observations and the null hypothesis that the variance of the residual is constant (homoscedasticity) could not be rejected in cases of the countries assessed except only in the case of Ghana.

Table 5.8: Results of Post-Estimation Diagnostic Tests for ARDL Models of Super-Neutrality of Money (Inflation and Money Supply Growth) Estimations

Schwarz Criterion Automatic Lag Selection ARDL Model						
Tests	***Gambia***	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
JB Statistics for Normality	399.1780 (0.00)	117.203 (0.00)	23.0540 (0.00)	14.0599 (0.00)	27.6388 (0.00)	2.1249 (0.31)
Breusch-Godfrey Serial Correlation LM	0.5353 (0.59)	0.0166 (0.98)	0.3627 (0.70)	0.6464 (0.53)	0.1045 (0.90)	1.4401 (0.25)
White Heteroscedasticity	0.9963 (0.44)	3.2953 (0.02)	3.5081 (0.40)	0.1552 (0.98)	0.3619 (0.87)	0.3702 (0.86)
Fixed Lag Selection ARDL (1,1) Model						
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
JB Statistics for Normality	271.3881 (0.00)	119.093 (0.00)	3.4843 (0.17)	11.6190 (0.00)	28.2664 (0.00)	0.1362 (0.93)
Breusch-Godfrey Serial Correlation LM	1.0603 (0.36)	0.0132 (0.99)	1.0889 (0.36)	0.5565 (0.58)	1.5698 (0.23)	1.7790 (0.19)
White Heteroscedasticity	5.2196 (0.00)	2.8549 (0.02)	0.5713 (0.80)	0.2113 (0.99)	0.5005 (0.86)	0.6804 (0.72)

Source: Author's Estimation and EViews 9 Output.

Note: The p-values are in parenthesis.

When the lag selection was fixed at ARDL (1, 1), we rejected the null hypothesis of normal distribution of residuals only for Guinea and Sierra Leone given the insignificance of the tests statistics. Again, there were no autocorrelation problems in the estimation as evident by the insignificant coefficients yielded by the serial correlation LM tests. Nevertheless, The

Gambia and Ghana displayed heteroscedasticity problem in the White heteroscedasticity test performed.

***Discussion of the Results of Money Super-neutrality Tests with respect to Real Output Growth*:** Results presented in Table 5.9 below indicate the outcomes of the cointegration relationship tests of money supply growth rate and real output growth. The outcome of the tests of the estimated SC automatic lag selection ARDL model suggested that apart from Liberian's case in which the test was inconclusive (because the test statistic fell in-between the lower and the upper bounds), money is not super-neutral in the WAMZ. When lag lengths were fixed and an ARDL (1, 1) was estimated for the six countries, the diagnostic tests reveal autocorrelation of the disturbance terms in the cases of The Gambia, Ghana and Liberia. In order to eliminate these serial correlations, the lag length of the dependent variable (output growth) of the affected countries were increased as shown in Table 5.9. The results under this estimation show that the null hypothesis of no long run cointegration could be rejected only in the case of Liberia, implying money supernuetrality in the country. These denote that the growth rates of money supply in the WAMZ countries (except Liberia) have impacts on changes in the real variable (in the five countries). These results have further implications for the application of money supply as monetary policy instrument under the future common monetary policy by the expected common central bank in the proposed monetary integration.

Table 5.9: Results of the ARDL Bound Tests of the Super Neutrality of Money with respect to Real Output Growth

Schwarz Criterion Automatic Lag Selection ARDL Model		
	F-statistics	*Cointegration (at 95% Confidence Level)*
The Gambia (ARDL 2,0)	13.2137	Yes: Reject null hypothesis
Ghana (ARDL 1,0)	7.2698	Yes: Reject null hypothesis
Guinea (ARDL 1,0)	5.0951	Yes: Reject null hypothesis
Liberia (ARDL 1,0)	3.7345	Inconclusive
Nigeria (ARDL 1,0)	8.2360	Yes: Reject null hypothesis
S/Leone (ARDL 1,0)	9.4097	Yes: Reject null hypothesis
Fixed Lag Selection ARDL Model		
	F-statistics	*Cointegration (at 95% Confidence Level)*
The Gambia (ARDL 2,1)	14.3932	Yes: Reject null hypothesis
Ghana (ARDL 2,1)	6.3177	Yes: Reject null hypothesis
Guinea (ARDL 1,1)	4.4007	Yes: Reject null hypothesis
Liberia (ARDL 2,1)	2.8959	No: Accept null hypothesis
Nigeria (ARDL 1,1)	6.952	Yes: Reject null hypothesis
S/Leone (ARDL 1,1)	8.2998	Yes: Reject null hypothesis

ARDL Critical Values Bounds				
Bounds	***1%***	***2.5%***	***5%***	***10%***
Lower Bound	4.94	4.18	3.62	3.02
Upper Bound	5.58	4.79	4.16	3.51

Source: Author's Estimation and Eviews 9 Output

Table 5.10: Coefficients of Long Run Relationship and Error-Correction (Super Neutrality of Money with respect to Real Output Growth)

Schwarz Criterion Automatic Lag Selection ARDL Model						
Dependent Variable: Real Output Growth						
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Money Supply Growth	0.0520***	-0.0009	-0.0031	-0.0209	-0.0039	-0.0224
(Long Run Coefficient)	(0.0276)	(0.0381)	(0.0089)	(0.1703)	(0.0995)	(0.0613)
Error Correction Term	-17071*	-0.7684*	-0.9277*	-0.5715*	-0.8454*	-0.8657*
(Coint. Coefficient)	(0.2513)	(0.1674)	(0.2438)	(0.1580)	(0.11789)	(0.1754)
Fixed Lag Selection ARDL Model						
Dependent Variable: Real Output Growth						
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Money Supply Growth	0.0629***	-0.0564	-0.0040	-0.1255	0.0211	-0.1052
(Long Run Coefficient)	(0.0366)	(0.0421)	(0.0144)	(0.2277)	(0.1227)	(0.0755)
Error Correction Term	-1.7046*	-0.7829*	-0.9270*	0.5623*	-0.8439*	-0.8934*
(Coint. Coefficient)	(0.2503)	(0.1735)	(0.2432))	(0.1823)	(0.1782)	(0.1732)

Source: Author's Estimation and Eviews 9 Output

Note: The standard errors are in parenthesis.

The SIC lag selection ARDL model estimation results in Table 5.10 above show that the long run relationship coefficients of money supply growth were negative and insignificant for all

the WAMZ countries, except for The Gambia where it is positive (0.0520) and significant at 10% level of significance. The short run error correction term coefficients were negative (as expected) and are all significant at 5% level. For the fixed lag ARDL models, all the coefficients of money supply growth were insignificant and negative for Ghana, Guinea and Nigeria. As expected, the short run relationship error correction term (ECT) coefficients were significantly negative for all the WAMZ countries assessed.

Table 5.11 below show the results of the diagnostic tests of the ARDL models of super-neutrality of money. As obtained in the results of the diagnostic test of monetary neutrality estimations of the SIC lag selection ARDL model, the hypothesis of normality of residual was rejected at 5% significance level of J-B statistics in the case of Ghana, Liberia and Sierra Leone. For the fixed lag ARDL model, we could only reject the null hypothesis of normality for Liberia and Nigeria.

Table 5.11: Results of Post-Estimation Diagnostic Tests for Super Neutrality of Money ARDL Model Estimations (Real Output Growth and Money Supply Growth)

Schwarz Information Criterion Automatic Lag Selection ARDL Model						
Tests	***Gambia***	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
JB Statistics for Normality	1.3940 (0.50)	10.2970 (0.00)	2.1190 (0.35)	219.275 (0.00)	145.307 (0.00)	6.1007 (0.05)
Breusch-Godfrey Serial Correlation LM	0.0943 (0.91)	5.9848 (0.01)	0.1933 (0.83)	0.0980 (0.91)	0.8981 (0.42)	2.4942 (0.10)
White Heteroscedasticity	1.3130 (0.29)	0.5542 (0.73)	0.8387 (0.54)	0.1219 (0.99)	0.1471 (0.98)	0.1085 (0.99)
Fixed Lag Selection ARDL (1,1) Model						
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
JB Statistics for Normality	1.5694 (0.46)	0.5090 (0.76)	1.6759 (0.43)	150.5912 (0.00)	138.69 (0.00)	5.7104 (0.06)
Breusch-Godfrey Serial Correlation LM	0.1843 (0.85)	1.7365 (0.20)	0.2943 (0.75)	0.0116 (0.99)	1.0122 (0.38)	1.3662 (0.27)
White Heteroscedasticity	1.6752 (0.16)	0.4216 (0.95)	1.7864 (0.16)	15.1452 (0.00)	0.1075 (0.99)	0.6060 (0.78)

Source: Author's Estimation and Eviews 9 Output.

Note: The p-values are in parenthesis.

On serial correlation tests, there was autocorrelation problem for only Nigeria where the Breusch-Godfrey Serial Correlation LM tests (including 2 lags) indicated significance at 5% level in both lag selection ARDL models estimations. The null hypothesis of heteroscedasticity was rejected only for Nigeria at 5% significance level in the White heteroscedasticity diagnostic test conducted for the two lag selection ARDL models estimations. White heteroscedasticity test is often seen as general test in which null points to the conjecture that the variance of the error term is constant.

Table 5.12: Results of the Parameter Stability Tests

Money Neutrality in respect of Real Output						
	Gambia	Ghana	Guinea	Liberia	Nigeria	S/Leone
CUSUM:						
Schwarz:	ST	ST	ST	ST	ST	ST
Fixed:	ST	ST	ST	ST	ST	ST
CUSUMSQ:						
Schwarz:	ST	ST	NST	NST	ST	ST
Fixed:	ST	ST	NST	NST	NST	NST
Money Superneutrality in respect of Output Growth						
	Gambia	Ghana	Guinea	Liberia	Nigeria	S/Leone
CUSUM:						
Schwarz:	ST	ST	ST	ST	ST	ST
Fixed:	NST	ST	ST	ST	ST	ST
CUSUMSQ						
Schwarz:	ST	ST	NST	NST	NST	ST
Fixed:	ST	ST	NST	NST	NST	ST
Money Superneutrality in respect of Inflation Rates						
	Gambia	Ghana	Guinea	Liberia	Nigeria	S/Leone
CUSUM:						
Schwarz:	ST	ST	ST	ST	ST	NST
Fixed:	NST	ST	ST	ST	ST	NST
CUSUMSQ						
Schwarz:	NST	ST	NST	ST	ST	NST
Fixed:	NST	ST	ST	ST	ST	NST

Source: Author's Estimation and EViews 9 Output.
Note: ST stands for 'Stable' while NST denotes 'Not Stable'.
The parameter stability tests were within 5% significance lines

A general important note to make at this point is that long run coefficients in the estimated ARDL models were statistically insignificant does not denote misspecification since indications of cointegration were revealed in the results of the cointegration bounds tests. If

the variables fail to affect each other in the long run, they are doing that in the short run when the ECM coefficients are expected to be negative and significant in order to establish the model convergence which is indirect connotation of significant long run relationship. The closeness of these ECT coefficients (which should be significant) to -1 is the indication of how strong the equilibrium was. For all the estimated ARDL models, the plots of the residual stability cumulative sums (CUSUMS) and the cumulative sums of square (CUSUMS SQ) of the deviation of the value from targets at 5% significance levels are displayed in Appendix 5.1 of the thesis report. These give information about the stability of the estimated models. The plots reveal parameter instability (or otherwise) in the ARDL model estimations performed.

In spite of the charts, Table 5.12 above summarises the outcomes of these model parameter stability.

The observation at this point is that for some WAMZ countries in the three categories of assessments of money neutrality (and money superneutrality), the SIC automatic lag selection procedures performed poorly and failed to fix lags for the independent variables (money supply and money supply growth); and due to this, at this point this study discarded with the outcomes of the SC automatic lag selection ARDL model estimations and consequently draws its major conclusions and inferences from the fixed lag selection ARDL models. The implications of the results of the fixed lag model estimations for the WAMZ countries are highlighted in Table 5.13 below.

Table 5.13: Summary of Outcomes of Money Neutrality and Superneutrality Assessments of the WAMZ

Money Neutrality	
With respect to:	***Real Output***
The Gambia	Not neutral
Ghana	Not neutral
Guinea	Neutral
Liberia	Neutral
Nigeria	Not neutral
S/Leone	Not neutral

Money Superneutrality		
With respect to:	***Inflation Rate***	***Output Growth***
The Gambia	Not super-neutral	Not super-neutral
Ghana	Not super-neutral	Not super-neutral
Guinea	Not super-neutral	Not super-neutral
Liberia	Not super-neutral	Super-neutral
Nigeria	Not super-neutral	Not super-neutral
S/Leone	Not super-neutral	Not super-neutral

Source: Author's Estimation and EViews 9 Output.

What these results generally denote for the WAMZ as a monetary zone is that money is neither neutral nor super-neutral in the West African monetary union, except for Liberia which less than 1% in economic size of the entire monetary zone. What this has an implication is that a future common central bank with a single monetary policy for the entire monetary zone can through money supply (as monetary policy instrument) affect real macroeconomic variables to achieve economic objectives and the stability of the monetary zone.

5.3 Monetary Reactions

There is a general monetary theory postulation that a dual relationship exists between monetary policy actions and how some variables (real/nominal) develop. What this means is that although, monetary policy impacts real and nominal variables (at least in the short run), monetary policy actions in themselves are however subject to prior realisation of particular variables. Monetary policy reaction functions are therefore estimated to account for that relationship. Monetary reaction function is the response of policy instrument to movements in fundamental macroeconomic variables of inflation and output gap. This section of the thesis

examined monetary reaction in the WAMZ and their similarities among member countries. The research question answered here was if there are similarities in the reactions of monetary policy instruments to the related economic fundamentals in the WAMZ. Results generated from this section have information for the design of a future common monetary policy for the proposed monetary union.

5.3.1 Theory and Models

A policy rule serves as guidance to monetary policy maker in achieving policy objectives. Policy rules describe how the monetary authority adjusts the monetary policy in reaction to macroeconomic changes. Within the confines of policy rule, a monetary policy can be evaluated to recommend present policy actions and predict future policy actions. There are two major forms of monetary policy rules: (i) the optimal monetary rules and (ii) the simple monetary rules. Optimal monetary rules are generally derived theoretically through the analysis of the optimal behaviour of the central bank within the context of its loss function and first order condition of its welfare maximisation, subject to macroeconomic model and structural restraints. This form of policy rule reflects the minimum welfare loss, given the macroeconomic structure and disturbances variability impacting the economy. Therefore, optimal rule is very sensitive to specific assumption underlying the macroeconomic model. Simple monetary rules are feedback instrument rules involving monetary instrument's reaction to some microeconomic variables like inflation, output gap, nominal output growth deviations, exchange rate movements etc. These intuitively have some bearing with monetary policy conduct. A simple monetary rule can further be described as a reaction function which directs the policy changes in response to the values and nature of changes and movements in some key underlying macroeconomic variables. Such rule prescribes a certain course of monetary policy action to follow in monetary policy decisions and these prescriptions serve as guide for monetary policy makers when setting the monetary policy instrument. Monetary

policy is set exogenously under the policy rule system. This means that policy instruments are allowed to react to the appropriate variables (like inflation, output gap). This 'exogenously' simple monetary policy rule attracts interests and attention among academics and policy makers than the theoretically derived optimal rule because of its close relationship with decisions and operations of the actual monetary policy. Taylor rule, McCallum rule and other hybrid versions of these rules are the popular forms of simple policy instrument rules.

Both Taylor rule (TR) and McCallum rule (MR) are simple feedback monetary instrument rules derived from the wealth maximisation first order condition of the central bank, which is determined by the economic situation within which monetary policy rules operate (Kahn, 2012). TR is however, more prominent than McCallum (MR). One reason that could be given for this is that monetary authorities in industrial countries focus on interest rate (rather than base money growth) in designing their monetary policy (McCallum, 2002). As also observed by Cochrane (2007), some central banks got interest in the new Keynesian TR to neglect monetary aggregate for interest rate target. Nevertheless, Beck and Weiland (2008) emphasise the relevance of monetary base (or some other monetary aggregates) as reasonable monetary instruments.

As a simple policy rule, the Taylor Rule (TR) reflects the reaction of short term interest rate to the deviations of inflation from its targets as well as the deviations' of output from its potentials. TR is thus a monetary policy reaction function in which the policy interest rate reacts to shocks to inflation and also to shocks to output gap. By the implications of the reaction function, the version of Hybrid McCallum Taylor Rule (HMTR) reaction function developed and applied in monetary reaction assessments here expresses the money supply growth rate a function of the output gap growth and inflation gap growth. The notion behind this is that whenever the rate at which output exceeds its potential is rising, this signals inflationary pressures and consequently, the monetary authority should reduce the rate of

money supply growth in order to accommodate such pressure. Similarly, when the degree at which inflation rate deviates from its desire rate is fast, the policymaker should reduce money supply growth rate.

The significance of this monetary reaction study to monetary integration is that the degree of homogeneity in monetary reactions of member countries of a monetary union reveals the degree of similarity of the aggregated shocks hitting these individual economies. In assessing the homogeneity of monetary policies of the WAMZ countries, it is therefore necessary to estimate such monetary reaction function equations for these WAMZ countries because there are tendencies that the zone's future monetary policy may deviate from rules when aiming at accommodate goals other than price stability and economic growth.

The WAMZ countries are developing economies. Due to the underdevelopment of financial markets (money and capital markets) in the developing/emerging countries, it is common that the effect of interest rate on inflation as manifested in the monetary policy transmission mechanisms in these countries are very sluggish and should not have attracted much attention being offered by the TR. Moreover, in these developing countries of inflation targeting, money aggregate may be playing more pronounced significant roles. For these reasons, monetary base aggregate is introduced here as a variable. This is perceived to be a more appropriate alternative monetary reaction function for developing countries.[93] This novel step taken here deviated from methods applied in many extant research studies on monetary reactions analyses. The central point of this thinking is that the monetary base could better be manipulated to control inflation thus:

$$\Delta M_t = \alpha - V_t + \gamma inf g_t \qquad 5.14$$

[93] McCallum (1988)

Where ΔM_t is the growth rate of monetary base (M_1), and $V_t$is the monetary base velocity γ is the parameter indicating how output deviation reach its target value with monetary base (which is the policy instrument in this case). If the equation (5.14) is adapted into the TR, it becomes the variant hybrid McCallum-Taylor rule (HMTR) modelled as:

$$\Delta M_t = \alpha + \Delta inf g_t + \Delta y g_t \quad 5.15$$

In lending weight to the views of Goodhart and Hofman, (2002), because the decision making process of the policymaker depends on many economic indicators apart from output gap and deviations from inflation, there may be spurious and questionable estimation results if some relevant variables are omitted. Therefore, for developing and open economies of the WAMZ countries, this study considers the inclusion of the deviations of annual percentage change of primary commodity price from its potentials, in the model of monetary policy rules considered here. The justification for this is the conjecture that such commodity price movements cause huge fluctuations in exchange rates and real economic activity for these primary commodity exporting countries. For inflation targeting open economies, the reaction function respond first to external disturbances, among a collection of extensive information. This brought out the relevance of commodity exports in monetary policy. For the purposes of money supply growth rate smoothing and the associated inertia, the HTMR was augmented with one-period lagged growth rate of money supply. To this effect, the variables of interest for the purpose of assessing the similarities in monetary reactions in the WAMZ in this novel contributions are the lagged money supply growth, growth rate of output gap, output gap, annual change of inflation deviation from its potentials and the growth rate of the deviation of the WAMZ country specific average commodity price from its potential.

Generally, policymakers make policy decisions based on the evaluation of future economic condition rather than contemporaneous condition, even as monetary policy is effective only with the incorporation of lags. TR is essentially 'forward-looking' if the central bank (CB) as

policymaker reacts to some expectations of inflation and output. CBs are able to establish the incorporation of past or current economic condition and the significant inclusion of economic forecasts in their macroeconomic policy statements. Some authors have asserted the consistency of forward-looking monetary policy reaction functions with observed behaviour of CBs.[94] Therefore, in order to control for past effects and expectations of the growth rates of the variables of interest in the monetary reaction model, their one-period leads and lags were added to the right hand side of the model as independent variable. Time trend was introduced into account from the pattern of the shift in the equation function and to determine across the WAMZ countries, the relevance of time in the determination of the influence of independent variable as well as the degree of its impact on annual growth rate of money supply.

5.3.2 Data and Methods

Given the description of the model of monetary reactions described above, the econometric equation estimated for the purpose of achieving the research objectives of this section of the thesis is expressed thus:

$$\Delta M_t = \alpha + \beta_1 \Delta M_t + \beta_2 yg_t + \beta_3 infg_t + \beta_4 cmpg_t + \gamma_1 yg_{t-1} + \gamma_2 infg_{t-1} + \gamma_3 cmpg_{t-1} + \delta_1 yg_{t+1} + \delta_2 infg_{t+1} + \delta_3 cmpg_{t+1} + \theta T_t + \varepsilon_t \quad 5.16$$

where T is the time trend. This model of a monetary reaction estimated reflected the leads and lags of the four variables. β_1 is the parameter of the degree of 'monetary policy inertia'; this, in addition to β_2 , β_3 and β_4, are the parameters of interest for monetary reaction comparison across the WAMZ.

Annual data of nominal GDP, inflation rate and money supply for the WAMZ countries as well as commodity price index were applied in this evaluation. These data cover the period

[94] Gali and Gertler (1998, 2000) and Orhanides (1998)

from 1980 to 2014. Nominal GDP and money supply data taken in the local currency units were expressed in logarithmic form. Inflation rate was taken as the year-on-year changes in inflation calculated with the GDP deflator. The country-specific primary commodity prices employed in this work were constructed as the average of the prices of the top three exports primary commodities of each country; and the annual percentage change in the average commodity price were estimated and applied. In the calculation of the deviations from the potential, of nominal GDP, inflation rate and the country-specific commodity prices, the Hodrick-Prescot (with lambda (λ) =100 for annual data) filter method was applied to filter the potential (trend) from the actual data. To ensure the stationarity of the variables used, the ADF unit root tests were carried out at the initial stage. The OLS method was employed in estimating the functional form econometric Equation 5.6 towards generating the monetary reactions coefficients for the WAMZ countries under assessment. In order to ensure parameter stability and avoid bias, inefficient and spurious estimations, some post-estimation diagnostic tests were carried out and necessary adjustments made.

Furthermore, monetary reaction functions across the WAMZ were assessed by applying quantile regression (QR) to monthly data spanning between 2000 and 2015 in which nominal income gap of the formal economy, inflation deviation from targets, commodity price gap, nominal income gap of the informal economy and lagged dependent variable were employed as explanatory variable in a model in which the monetary policy instrument of money supply is the dependent variable. Specifically, informal nominal GDP figures were generated for the WAMZ countries by equating these to be proportions of the formal GDP as exhibited in Table 3.1. Commodity price index was calculated specifically for each WAMZ country by applying the period-average proportion of the top primary commodity exports of each country in the total exports of the country as weight, to commodity price index of the categories of primary commodities in which the top export commodity of each country falls.

Consequently, the four primary commodity categories involved in these calculations were: (i) oil and meals (for The Gambia), (ii) precious metals (for Ghana, Guinea and Liberia), (iii) metals and mineral (for Sierra Leone) and (iv) energy (for Nigeria). The econometric equation estimated for the monthly data here is expressed thus:

$$M_t = \alpha + \beta_1 M_{t-1} + \beta_2 fyg_t + \beta_3 infg_t + \beta_4 cmpg_t + \beta_5 nyg_t + \varepsilon_t \quad 5.16$$

where is fyg_t and nyg_t formal nominal output of the formal and the informal economies respectively. As a deviation from the previous assessments of monetary reactions above, where annual change variables were applied, this assessment with monthly data made use of data at their levels. Quantile regression approach was used in the generating the explanatory powers the monetary policy reaction fundamentals in these respects. The following paragraphs justify the use of this method.

In econometric modelling, it is possible not to have predictive or strong relationship between the mean of the dependent variable and the independent variable distribution because of many factors affecting a dependent variable may be omitted in the modelling. In spite of this, there may still be some vital predictive relationship with some other components of the dependent variable distribution. Since most regression models analyse the conditional mean of the response variable, there are now growing interests in the modelling of other portion of the dependent variable conditional mean. Quantile regression is a method that does this by modelling the quantiles of the response variables by giving the linear relationship between explanatory variable and a given dependent variable quantile. Quantile regression (QR), initially developed by Koenker and Bassett (1978) allows for the influence of the independent variable on the median or other quantiles/percentiles of the dependent variable. It is prudent regression method (an alternative to the traditional OLS method) characterised by reduced sensitivity to the violation of the classical model assumptions (BLUE- best, linear unbiased estimators). A fundamental limitation of the OLS is its concentration on the estimation of

mean value of the dependent variable, conditional on the given values of the independent variables. The observation is that most of the econometric estimations are averagely based on mean, whereas, many variables are characterised by continuous distribution which are bound to change (either by compression or expansion) in a way that could not be revealed by the analysis of the mean, thus preventing the knowledge of how the whole distribution behaves. Quantile regression (QR) attends to this shortcoming by assessing fuller description of the conditional distribution of the variables rather than just the conditional mean as we have in the OLS method (Gujarati, 2015). The QR approach reveals how median, a measure of central tendency (central probability distribution) which as an alternative to mean, is impacted by independent variables. The median (or the selected quantile) of the dependent variable is estimated conditional on independent variable values in QR but the OLS estimates the mean of the dependent variable. While the OLS method finds the regression plane that minimises the sum of the square residuals, the QR finds the regression plane that minimises the sum of the absolute residuals. In high skewed distribution, the median provides more information and is less-sensitive to outliers (unlike the mean).

The least absolute deviation (LAD) estimator is a special form of QR in which the effects of independent variables on different parts (not only the median or the mean) of the dependent variable distribution are estimated. This came up because of the distortions of the OLS estimates by outliers. LAD guides the effects of outliers as a result of the lower extent of sensitivity when compared with the OLS estimations. It reduces the rate at which econometricians are concerned with 'undue influence' of observation in OLS estimates. The objective function of LAD is linear, implying that the LAD objective function would increases by one unit as a positive residual increases by one unit; but in contrast there is increasing importance given to large residuals by the OLS objective function, thereby making OLS to be more sensitive to outlying observations (Wooldridge, 2014). The less-sensitivity of

LAD to data extreme value changes (compared to the OLS) caused LAD not to give increasing weight to disturbance terms that are larger. The design of LAD is in a way that it estimates parameters of the conditional median (rather than the conditional mean) of the dependent variable, given the independent variables. This buttresses the fact that LAD are resilient to outliers since large changes in outliers have no effects on the median. These justify the advantage of LAD over the OLS in that partial effects (predictions) can be obtained easily, particularly, when data are transformed.

The conditional quantile function is the basic underlying principle of the quantiles of the QR model (which can model any quantile). The approach requires no strong distributional assumption about the disturbance term unlike the requirements of error term normality in the OLS modelling. Quantiles indicates where an observation lies within an ordered series of dependent variable. The median is at the middle, 25^{th} percentile (for instance) is lower in value and below the median (which is the 50^{th} percentile).

To filter the potential (trend) from the actual monthly data on nominal GDP (formal and informal) and the commodity price index, the Hodrick-Prescot (with lambda (λ) =14,400 for monthly data) filter method was employed. As the first step, the ADF unit root tests were performed for these monthly variables involved.

5.3.3 Results and Findings

Table 5.14 below, reflects the outcomes of the ADF unit roots tests on the variables employed in this section of the chapter. The results reveal that at 5% level of significance, inflation gap and commodity price gaps were stationary at their levels. For five WAMZ countries (excluding Nigeria), output gap is stationary, but made stationary for Nigeria at the second order differencing.

Table 5.14: Results of the ADF Unit Roots Tests of Monetary Reaction Variables

	Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*S/Leone*
∆***Money Supply***						
(Level):	-6.9600*	-5.3255*	-5.9122*	-3.030**	-3.3691**	-5.4827*
(1st Difference):				-7.5763*	-8.1889*	
∆***Nominal Output Gap***						
(Level):	-6.4725*	-5.6319*	-3.8685*	-5.3692*	-2.5475	-5.2661*
(1st Difference):					-2.7687***	
(2nd Difference):					5.6281*	
∆***Inflation Gap***						
(Level):	-6.4505*	-4.6722*	-3.7486*	-5.5274*	-6.6187*	-5.6038
∆***Commodity Price Gap***						
(Level):	-6.6687*	-6.3313*	-6.2279*	-6.3313*	-6.1138*	-6.3313*

Critical Values of ADF Unit Roots Test		
1%	***5%***	***10%***
-3.9591	-3.0810	-2.6813

Source: Author's Estimation and EViews 7 Output

Note: For the unit roots tests *, ** and ** denote 1% and 5% levels of significance respectively.

Table 5.15: Results of the Estimation of the Augmented HMTR Monetary Reactions

Dependent Variable: ∆***Money Supply***						
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
∆*Money Supply(t-1)*	-0.2613	-0.2962***	-0.7033**	-0.4141***	-0.3121	0.4103***
∆*Output Gap*	0.9122*	-0.0006	0.7538*	0.0210	-0.0689	0.8400*
∆*Inflation Gap*	-0.9497	-0.3213*	-0.8478*	0.5450	-0.0403	-0.9494*
∆*Commodity Price Gap*	0.0049	0.0890	0.0216***	-0.0309	-0.0624	0.0517
∆*Output Gap(t-1)*	0.2237	-0.0081	0.4696	-0.1101	-0.0441	-0.2811
∆*Inflation Gap(t-1)*	-0.2462	-0.1690***	-0.5078	0.6177	-0.0122	0.3529
∆*Comm. Price Gap(t-1)*	-0.0141	0.0969	0.0147	-0.0812	-0.0352	0.0465
∆*Output Gap(t+1)*	-0.0207	0.0699	-0.2097	0.1561**	0.0007	-0.0263
∆*Inflation Gap(t+1)*	0.2300	-0.1552	0.1413	-1.0753	-0.0050	0.0661
∆*Comm. Price Gap(t+1)*	-0.0044	0.0491	0.0174***	-0.1258	-0.0244	0.0561
Time Trend	0.0004	0.0025	-0.0009*	-0.000	-0.0009	0.0015
R2	0.88	0.57	0.88	0.47	0.29	0.80
DW-Statistics	1.57	2.19	1.42	2.20	2.07	1.83
F-Statistics	13.7778	2.4358	9.6011	1.5283	0.6717	7.4914
	(0.00)	(0.04)	(0.00)	(0.20)	(0.75)	(0.00)
Diagnostic Tests						
JB Statistics for	5.8675	2.5983	0.3791	14.6123	0.0953	0.7932
Normality	(0.05)	(0.27)	(0.83)	(0.00)	(0.95)	(0.67)
Breusch-Godfrey	3.1045	3.9608	3.3809	1.3028	0.5218	0.1796
Autocorrelation	(0.08)	(0.05)	(0.07)	(0.25)	(0.47)	(0.67)
Breusch-Pagan-Godfrey	12.2058	11.6859	14.0756	4.7036	8.2562	12.5194
Heteroscedasticity	(0.35)	(0.39)	(0.23)	(0.94)	(0.69)	(0.53)
Ramsey-RESET	0.0909	1.1924	1.4723	0.3498	1.6656	0.6867
Functional Form	(0.93)	(0.25)	(0.16)	(0.73)	(0.11)	(0.50)

Source: Author' Estimation and EViews 7 Output

Note: *, ** and ** denote 1% and 5% levels of significance respectively. The p-values are in parentheses.

The estimations of the augmented HMTR models exhibited in Table 5.15 above show that the leads and lags of output gap, inflation gaps and commodity price gaps are generally not statistically significant at 5% level. It is also apparent that apart from the statistical significance at 10% of commodity price gap, only in the case of Guinea, this variable is not significant in other cases. These insignificant variables were consequently deleted from the model of HMTR.

Following the deletion of the insignificant variables from the earlier estimated model, in a consequential HMTR model estimated, the results in Table 5.16 below indicate that output gap coefficients are positive for all countries apart from the coefficient for Nigeria, while inflation gap coefficients displayed negative signs for all the WAMZ countries. The coefficients of determination (R^2) measuring the goodness of fit of the model are low in three countries. The Durbin-Watson (DW) statistics testing serial correlation were reasonably good. However, the closeness to 2 of the DW statistics might be as a result of distortions caused by the inclusion of lagged dependent variable (lagged money supply growth) in the model. The post-estimation diagnostic tests however showed that The Gambia, Ghana and Liberia failed the essential residual normality tests as revealed by the significance at 5% level of significance of J-B statistics and there is serial correlation in the case of Guinea. The functional form Regression Error Specification Test (RESET) is significant at 5% level, only for Liberia, thus suggesting non-linearity of the explanatory variables. Multicollinearity checks were performed with the estimation of the variance inflation factors (VIF) which revealed some collinearity, following the standard in which a VIF of more than the value of 4 calls for further analysis while a VIF of greater than 10 signals high level of collinearity.

Table 5.16: HMTR Monetary Reactions Augmented (with money supply growth smoothing and time trend)

Dependent Variable: ΔMoney Supply						
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
ΔMoney Supply(t-1)	-0.0307	-0.1192	-0.2442**	0.3538***	0.3878**	0.1839**
ΔOutput Gap	0.9038*	0.0034	0.9461*	0.0625	-0.0423	0.9025*
ΔInflation Gap	-0.9433*	-0.1928*	-1.0108*	-0.5109	-0.0592	-1.0128*
ΔTime Trend	0.0002	0.0020**	-0.0007	0.0057	0.0011	0.0020
R2	0.86	0.35	0.80	0.35	0.31	0.75
DW-Statistics	2.15	1.77	2.53	2.06	1.98	1.65
F-Statistics	45.0620	3.785	22.6849	3.7344	3.0973	21.2541
	(0.00)	(0.01)	(0.00)	(0.01)	(0.03)	(0.00)
Diagnostic Tests						
JB Statistics for Normality	6.5787	7.4332	2.7208	7.8234	0.9882	1.4346
	(0.04)	(0.02)	(0.26)	(0.02)	(0.61)	(0.49)
Breusch-Godfrey Autocorrelation	0.5115	0.0187	3.4044	0.2122	0.6623	1.4075
	(0.47)	(0.89)	(0.07)	(0.65)	(0.42)	(0.24)
Breusch-Pagan-Godfrey Heteroscedasticity	7.7089	2.1732	3.1987	3.8302	5.5550	0.6275
	(0.13)	(0.70)	(0.53)	(0.43)	(0.23)	(0.96)
Ramsey-RESET Functional Form	0.0054	0.0045	1.7502	9.2321	0.4331	1.2642
	(0.94)	(0.95)	(0.20)	(0.00)	(0.52)	(0.27)
Variance Inflation Factors:						
ΔMoney Supply(t-1)	1.928	1.197	1.821	1.795	1.250	1.372
Output Gap	30.535	1.161	40.977	1.460	3.238	29.998
Inflation Gap	33.937	1.127	42.791	1.117	3.522	26.835

Source: Author' Estimation and EViews 7 Output

Note: *, ** and ** denote 1% and 5% levels of significance respectively. The p-values are in parentheses.

In proffering solution to problems detected by the post-estimation diagnostic tests, firstly, there were checks on the residual plots of The Gambia, Ghana and Liberia in efforts to attend to the related non-normality of the disturbance terms. These revealed some outliers. These outliers were removed and the model of monetary reaction was re-estimated, resulting in outcomes in Table 5.17 below.

Table 5.17: Adjusted HMTR Monetary Reactions Augmented (with monetary growth smoothing and time trend)

Dependent Variable: ΔMoney Supply						
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
ΔMoney Supply(t-1)	-0.0675	-0.0799	-0.2442**	0.5846*	0.3582**	0.1839**
ΔOutput Gap	0.9425*	0.01552	0.9461*	-0.0625*	-0.0477	0.9025*
ΔInflation Gap	-0.9799*	-0.2033*	-1.0108*	0.2250	0.0175	-1.0128*
Time Trend	-0.001	0.0009	-0.0007	0.0018	0.0011	0.0020
R2	0.97	0.56	0.80	0.80	0.33	0.75
DW-Statistics	1.61	1.51	2.53	1.02	1.91	1.65
F-Statistics	181.0444	8.0833	22.6849	21.4489	3.3203	21.2541
	(0.00)	(0.00)	(0.00)	(0.00)	(0.02)	(0.00)
Diagnostic Tests						
JB Statistics for Normality	0.3882	5.2736	2.7208	0.3591	3.8664	1.4346
	(0.82)	(0.07)	(0.26)	(0.84)	(0.14)	(0.49)
Breusch-Godfrey	0.0916	2.2842	3.4044	1.5853	0.1594	1.4075
Autocorrelation	(0.76)	(0.13)	(0.07)	(0.21)	(0.69)	(0.24)
Breusch-Pagan-Godfrey	4.1098	2.4155	3.1987	4.4371	3.7520	0.6275
Heteroscedasticity	(0.39)	(0.66)	(0.53)	(0.35)	(0.44)	(0.96)
Ramsey-RESET	0.5678	3.5085	1.7502	0.5207	0.6581	1.2642
Functional Form	(0.46)	(0.07)	(0.20)	(0.48)	(0.52)	(0.27)
Variance Inflation Factors:						
ΔMoney Supply(t-1)	1.1173	1.6335	1.821	7.5338	1.252	1.372
Output Gap	13.5314	1.2732	40.977	6.4400	1.360	29.998
Inflation Gap	13.1822	1.3019	42.791	1.5518	1.330	26.835

Source: Author' Estimation and EViews 7 Output

Note: *, ** and ** denote 1% and 5% levels of significance respectively. p-values are in parentheses.

The results failed to reveal similarities in monetary reactions across the WAMZ. The output gap reactions were negative for Liberia and Nigeria, while inflation gap coefficients were significantly negative for four WAMZ countries (The Gambia, Ghana, Guinea and Sierra Leone); and For output gaps and inflation gaps, the magnitudes of reactions were significantly higher for The Gambia, Guinea and Sierra Leone. These depicts similarities just in three countries of the WAMZ. What these means is that holding inflation gap and the effects of past money supply constant, for an increase by one unit of output gap, the change is expected to be positive in the Gambia, Ghana, Guinea and Sierra Leone (but negative in the case of Liberia and Nigeria). On the other hand, if inflation gap increases by one (holding the output gap and the money supply growth inertia constant), money supply growth would be

positive for Liberia and Nigeria, and negative for The Gambia, Ghana, Guinea and Sierra Leone. These changes would all be at the magnitude of the parameter coefficients yielded in Table 5.17 above. The low coefficients of time trends across all the WAMZ countries suggest that time is not important in the determination of the impact of output gap and inflation gap (including the effect of past money supply growth) on contemporaneous money supply growth. However, the statistical insignificance in these results were not overlooked as they imply the level of confidence with which inferences are drawn here.

The results of the diagnostic tests showed tremendous improvement over what were reported by the earlier estimation. However, with the VIFs in 40s, 20s and 10s, The Gambia, Guinea and Sierra Leone still failed the multicollinearity tests evidencing high degree of inflation of the variances of the estimated coefficients of output gaps and inflation gaps as well as correlation between these two independent variables. Solving these problems at this level, the 'centring' solution was made in which the respective mean of output gaps and inflation gaps for these three countries were calculated and new variables of output gap and inflation gap generated as the deviation of the original value of these variables from the calculated mean value. These efforts yielded no different results.

Estimations with Monthly Data: For the estimation of the monthly data of monetary reactions in the WAMZ, the results of the initial PP unit root (with constant) tests of the variables involved are exhibited in Table 5.18 below where is evident that money supply variable for The Gambia, and Sierra Leone all the response variables for all the WAMZ countries were stationary at their levels.

Table 5.18: Results of the PP Unit Roots Tests of Monetary Reaction Variables (Monthly Data)

	Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*S/Leone*
Money Supply						
(Level):	-4.392*	-2.132	-1.130	-0.330	1.794	-2.605***
(1st Difference):		-3.968*	-3.414*	-2.364	-1.738	-2.768***
(2nd Difference)				-13.504*	-13.889*	
Nominal Output Gap						
(Level):	-2.909**	-2.713***	-2.796***	-3.201**	-3.513*	-3.499*
Shadow Nominal Output Gap:						
(Level):	-3.981*	-6.063*	-3.260**	-2.999**	-4.101*	-2.896**
Inflation Deviation						
(Level):	-3.093**	-3.258*	-3.223**	-3.440*	-3.417*	-4.763*
Commodity Price Gap						
(Level):	-3.721	-4.255*	-4.255*	-4.255*	-4.040*	-3.580*

Critical Values of PP Unit Roots Test		
1%	***5%***	***10%***
-3.4646	-2.8765	-2.5748

Source: Author's Estimation and EViews 7 Output

Note: For the unit roots tests *, ** and *** denote 1%, 5% and 10% levels of significance respectively.

The outcome of the quantile regression estimations of the month data were as highlighted in Table 5.19 below to clearly show if there are similarities in the nature of monetary reactions and if the theoretically postulated signs were yielded by the monetary policy fundaments incorporated into the model variables.

The use of QR estimation method for monetary reactions here enabled varieties of results. Although, the method allows for the estimation results at various quantile points, this study limited itself to two quantiles (0.25 and 0.75) and the median. In Table 5.19, the bootstraps coefficients of monetary reactions generated for the six WAMZ countries are reported at the estimated quantiles and the median. Generally, the results revealed that the signs and the magnitude of monetary reactions across the WAMZ were not similar in some respects apart from the lagged variable of the policy instrument applied here, money supply. In the WAMZ countries, while some reported fundamentals induced monetary expansion, some others propelled the contraction of money supply.

Table 5.19: Results of Monetary Reactions Model Estimations of the WAMZ Countries (2000-2015 Monthly Data)

Nominal Output Gap (Formal Economy)			
	25th Quantile Bootstrap Coefficients	*50th Quantile Bootstrap Coefficients*	*75th Quantile Bootstrap Coefficients*
Gambia	-1.303*	-1.101*	-0.6704*
Ghana	0.056	0.420*	0.625*
Guinea	0.425	-0.551*	-0.466*
Liberia	0.899	-1.969	-2.047*
Nigeria	0.079	0.070	1.532**
S/Leone	0.105	-0.517*	-0.537
Nominal Output Gap (Informal Economy)			
	25th Quantile Bootstrap Coefficients	*50th Quantile Bootstrap Coefficients*	*75th Quantile Bootstrap Coefficients*
Gambia	0.087	-0.222**	-0.026*
Ghana	-1.65*	-0.865*	-0.621**
Guinea	-0.602	-0.502	-0.352***
Liberia	-3.618	-0.095	-0.030**
Nigeria	-0.984	0.092	1.429
S/Leone	0.798**	-0.576	-0.950
Inflation			
	25th Quantile Bootstrap Coefficients	*50th Quantile Bootstrap Coefficients*	*75th Quantile Bootstrap Coefficients*
Gambia	1.241*	0.778*	0.457*
Ghana	0.057	-0.02	-0.096**
Guinea	0.864*	0.764*	0.926*
Liberia	0.415	0.917	0.945*
Nigeria	0.307*	-0.138**	-0.952*
S/Leone	0.035	0.112	0.071*
Commodity Price			
	25th Quantile Bootstrap Coefficients	*50th Quantile Bootstrap Coefficients*	*75th Quantile Bootstrap Coefficients*
Gambia	0.005*	0.024**	0.036
Ghana	0.020*	0.048	-0.043
Guinea	0.457***	-0.259*	-0.303***
Liberia	0.496	-0.066	-0.00
Nigeria	0.051	0.016	0.021
S/Leone	0.097*	-0.122*	-0.094*
Lagged Money Supply			
	25th Quantile	***50th Quantile***	***75th Quantile***
Gambia	0.913*	0.911*	0.895*
Ghana	0.987*	0.994*	0.991*
Guinea	0.944*	0.930*	0.952*
Liberia	1.034*	0.929*	0.937*
Nigeria	0.955*	0.966*	1.034*
S/Leone	0.970*	0.807*	0.975*

Source: Author's Estimation and EViews 10 output.

Note: For the unit roots tests *, ** and *** denote 1%, 5% and 10% levels of significance respectively.

For nominal output of the formal economy, signs of coefficient generated by most WAMZ countries at the median and 0.75 quantile were distinct from those positive and insignificant coefficients generated by at 0.25 quantile (apart from The Gambia). Most informal economy output gaps coefficients were negative, though not statistically significant for some of these

countries. Inflations coefficients were all statistically significant at 5% level only at the 75% quantile. The one-period lagged money supply variable (incorporated into the monetary reaction model as policy inertia) yielded closely-similar positive coefficients of reactions and were all significant at 1% for all the WAMZ countries. This asserted the strong influence of past money supply and past monetary policy actions on current monetary policies in the WAMZ. As established by other variables, the reactions of commodity prices were dissimilar, with different signs and magnitude, and were not significant in most cases. Because of the size of the Nigerian economy in the WAMZ as well as the possibility of building the future common monetary policy of the monetary zone around Nigeria, it is significantly necessary to pay specific attention to the results of monetary reactions of Nigeria in these estimations. In this respect, the only pleasant results here are from inflation across for the median and quantiles 0.25 and 0.75. Although, these coefficients were positive at 0.25, but yielded negative signs at the median and 0.75 quantile. These have implications for inflation targeting and policy objectives of the future common central bank of the WAMZ because increase in inflation rates would easily induce the common monetary authority to contract money supply by the magnitude approximate to the coefficient generated by Nigeria in this respect.

Diagnostic tests of the quantile and median coefficients and residuals of the QR were performed to test the symmetries in quantiles and slope equality, and normality of the regression residuals. The Newly-Powell test of conditional symmetry, the Koenker-Bassett test of quantile slope equality and the Jarque-Bera normality tests were carried out in these respects. The coefficient diagnostic tests were performed across the median and two quantile around the median (0.25 and 0.75) and thereafter compared with median specification. The Wald F-statistics of the symmetric quantile test is to test if the average value of the coefficient for symmetric quantiles around the median equals to the value of the median

coefficient. This is the conditional symmetry here. The results of these test were as exhibited in Table 5.20 below.

Table 5.20: Results of the Coefficient and Residual Diagnostic Tests of the Quantile Regressions

Symmetric Quantile Test Results						
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Wald F-statistics:	2.36	5.45	10.52	23.76	18.57	13.23
(Prob):	(0.88)	(0.49)	(0.11)	(0.00)	(0.00)	(0.04)
Quantile Slope Equality Test Results						
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Wald F-statistics:	15.91	51.12	20.37	28.30	24.68	51.27
(Prob):	(0.10)	(0.00)	(0.03)	(0.00)	(0.00)	(0.00)
Residual Normality Tests						
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
J-B Statistics:	17.13	29.37	28.48	30.21	56.37	15.91
(Prob):	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Source: Author's Estimation and EViews 10

From the QR for the WAMZ countries, this test revealed Wald statistics that are significant at 1% for Liberia, Nigeria and Sierra Leone. These denote strong evidence of asymmetries with the median coefficients for these countries. The insignificant coefficients for The Gambia, Ghana and Guinea exhibit symmetry which implies little evidence of departure of the quantile coefficients generated for these countries from the median. The results of the Wald tests for slope equality showed that apart from The Gambia, the F-statistics were significant for the other five WAMZ countries at 5% level of significance, thus yielding evidences to infer that that coefficients generated for these five countries differ across quantile values. The conditional quantiles are not identical, implying that the quantile regression for the five countries provided estimates that are superior to estimation procedures that assume that the forecast error are independent and identically distributed (i.i.d) random variables. The Jarque-Bera statistic for tests for residual normality were all significant at 5% level for all the WAMZ countries. This is an indication of that the residuals of the regressions models were not normally distributed.

The main findings of annual data estimations in this section is that monetary reactions in the WAMZ are only significantly similar around The Gambia, Guinea and Sierra Leone (at

similar magnitude) higher than those of the dissimilar results of the other three countries (Ghana, Liberia and Nigeria) where we can infer relationships with very low level of confidence. On the other hand, the monetary reactions results generated from the higher frequency monthly data estimations with quantile regression revealed mixed monetary reactions and lack of homogeneity to some extents in this respect. On the overall, the monetary reaction assessments here produced evidences to suggest that it may take long term adjustment for a single monetary policy to be suitable for all the six countries at a time. All things being equal and if past behaviour of the macroeconomic variables evaluated for the WAMZ countries are factors to reckon with, single monetary policy may not be suitable for the future monetary zone, given the diverse forms of reaction of the monetary policy instrument to inflation and output as revealed by the preferred and more reliable higher frequency monthly data.

5.4 Monetary-Fiscal Policy Interactions

The making of monetary policy and fiscal policy are two distinct functions of government. While monetary policy action relates to how a central bank controls nominal interest rates and money supply to impact economic conditions, fiscal policy is about the decision of government to raise revenue (tax) and about how proceeds from revenues are to be spent. The contention here lies in the conflicts of the objectives and targets of these policies and their instruments as well as the coordination of the two policies. Two major factors highlighted as the causes of the non-alignments in the two policies are: (1) policy's institutional structure; and (2) the credibility of the principal actors. These (and other factors) make the interactions of the two policies of government to be cloudy and more complex in the cases of monetary unions. As already indicated, the loss of monetary independence is a cost of joining a monetary union. If a monetary union is to be successful, price stability of member state

should be made paramount. However, with the loss of monetary powers at national levels, fiscal policy remains the only instrument available at national levels to maintain price stability. The loss of monetary sovereignty thus increases the potential role of fiscal policy as instrument of economic output stabilisation. The effectiveness of fiscal policy (in counteracting asymmetric and real economic shocks) is a strong determinant of the success of a monetary union.

In a monetary union, respective objectives and functions of common monetary policy and several national fiscal policies are clearly specified. Usually, the primary objective of a monetary union's monetary policy is the maintenance of price stability within the area covered by such monetary integration. On fiscal policy side, individual national authority is responsible for the commitment towards ensuring sound public finance, even if there are formal laid-down framework for fiscal coordination and other fiscal policy requirements across the monetary union. Towards the achievement of the overall goals of a monetary union, it is necessary for monetary and fiscal policies to interact well. One of the instance of monetary policy interactions with the fiscal policy is when a well formulated monetary policy (with its focus on price stability) promotes the stability of inflation expectations and ensures the achievement of low inflation risks premia. These together assist in reducing the level of long term interest rates and its volatility which in turn, benefits government's debt servicing costs. On the other hand, there are effects of fiscal policy on monetary policy when the supply side of the economy is shaped by tax regime adopted or when long term interest rate is influenced through public debt, making the demand side effect of fiscal policy to directly be on inflation outlook. Nevertheless, there are complications and complexities arising out of these owing to the feature of monetary unions in which there is a single monetary policy for many fiscal policies.

The formation of a monetary union (or the plan to form a monetary union) would raise some question about the combination of (and co-ordination of) monetary policy and fiscal policy as well as the determination of the optimal mix of the two economic policies. Member countries of such monetary union (or prospective monetary union), each with its own fiscal spending and revenue policy, are (will be) joined together by a single monetary policy in countries with varied population of private economic agents. Crucial questions that come to mind are: (a) if such common monetary policy has (or will have) same impact in each of the member countries; (b) if the effects on these countries would be according to their degree of public debts and sizes of these countries; and (c) how the separate fiscal policies affect (or will affect) the ability of the common central bank to control inflation and achieve its inflation targeting objective.

In spite of all these, a major issue of concern is that in a monetary union, national governments face a budget constraints and their decision-making is based on national variables while the supra monetary institution focuses on union-wide average variables. This makes the reaction of national governments to monetary policy and supply shocks not univocal. The main objective of this subsection of this chapter is the investigation of the form of the mix of monetary and fiscal policy that has sharpened the past across the WAMZ. These questions and concerns necessitate the investigation of policy mix in a monetary union member countries (or proposed member countries) in order to reveal in the economic regime is monetary dominant or fiscal dominant.

5.4.1 Theory and Models

Leeper (1991) classified the behaviours of fiscal and monetary authorities as portrayed by the theories in two forms (as further reflected in Leeper (1999)). These are (i) ‘passive behaviour’ and (ii) ‘active behaviour’. In general terms, Leeper (2016) connotes ‘active’ as a situation where the policy authority has the freedom to pursue its objective while ‘passive’

means the policy authority generates constraints through the active authority's behaviour and the price sector. These are from his view-points of his Fiscal Theory of Price Leve (FTPL), highlighting the two fundamental basic tasks of macroeconomic policies as: (i) the determination of inflation; and (ii) ensuring debt stability. Leeper (2016) stressed the two different mixes of the interplay of monetary and fiscal behaviours that can guarantee the delivery of these two fundamental tasks as: (a) active monetary policy with passive fiscal policy; and (b) active fiscal policy with passive monetary policy. Under aggressive inflation targeting regime (like in monetary unions), the policy combination of active monetary policy and passive fiscal policy (depicting monetary dominance) is appropriately necessary because under such policies combination, fiscal policy shocks would not be able to affect the price level. Simply put, under such regime, central bank raises nominal interest rate sharply whenever inflation rises (by the determination of inflation/price level) and then inform fiscal authority to ensure that whenever government debt rises, it should raise budget surpluses in future in order to finance that debt (in debt stabilisation). When active fiscal policy is combined with passive monetary policy, policy makers set surplus largely independent of the levels of government debt and inflation condition. The fiscal behaviour eventually determines the price level. Debt would then be stabilised when the monetary authority allows the surprise changes in inflation and prices of bonds to adjust the value of government debt (revaluation of government debt). This results into government debt's market value being equal to the present value of future surplus. Here, the monetary authority does not attempt at fighting inflation.

Monetary Regime (or M-Regime) and Fiscal Regime (or F-Regime) are the two regimes borne out of the summary of Leeper's propositions of the mix of the policies, described as 'consistent with a determinant equilibrium'. The equilibrium in the M-Regime relates to the conventional assignment of the two tasks of monetary control of inflation (for monetary

policy) and fiscal assurance of government solvency (for fiscal policy). This is believed to be a common model of central bank. The assignment of the two tasks is flipped in the F-Regime in which monetary policy is tasked with debt stabilisation and the price level determination is left with fiscal policy, thus altering the roles of the two policies. Table 5.21 below summarises the policies mix of price level determination and debt stabilisation.

Table 5.21: The Regimes of Two-Policy Mix of Price Determination and Debt Stabilisation

	The Nature of M-Regime	***The Nature of F-Regime***
Monetary Policy Actions	In targeting inflation, nominal interest rate is raised more than one-for-one with inflation.	In response to inflation, nominal interest rate is weakly adjusted in order to ensure that debt is not destabilised by interest payments on government debts.
Fiscal Policy Actions	Revenues (taxes) are raised when there is enough increase in real government debt to cover real debt services and eventually retire the increase in the principal value of debt.	Revenues (taxes) are made irresponsive to the state of government indebtedness and price level.
Label	Active monetary policy and passive fiscal policy. Monetary Dominance	Active fiscal policy and passive monetary policy. Fiscal Dominance

Source: Leeper, (2016)

The central point being stressed by Leeper's the active/passive framework is that there are different ways of determining the price levels, given the parameters of monetary and fiscal policy. In the M-Regime of active monetary policy and passive fiscal policy, the determination of the price level is governed by the quantity theory of money or the New Keynesian view of monetary policy, while in the F-Regime of active fiscal policy and passive monetary policy, the FTPL governs the determination of the price level. A very crucial and important to state that in both regimes, stability emanates from a passive policy that can accommodate the policy actions taken by the active authority. It is therefore necessary for an inflation targeting central bank to be confident that the behaviour of fiscal policy would be 'passive'. Nevertheless, a vital point to note (particularly, in cases of monetary unions) is that the control of inflation by monetary policy requires the appropriate support/backing of fiscal

policy, hence the need for the policies to interact well in order to achieve the two macroeconomic goals and avert economic crisis.

Leeper's model sees monetary policy goal as 'guiding inflation towards its target'. Therefore, a monetary policy is active when it is tight, contractionary and if the policy decisions guide inflation to its target. Monetary policy is passive when there is divergence from inflation target. On fiscal side, fiscal policy is active when it is loose, expansionary and allows budget deficit higher than the sustainable budget deficit; but passive when the policy is tight, contractionary and ensures long term equilibrium. What is drawn from these is the distinction in the domination of the economy – (monetary domination or fiscal domination). Table 5.22 reveals the clear distinction between a monetary dominance and fiscal dominance regimes.

Table 5.22: Distinction between Monetary Dominance and Fiscal Dominance

Monetary Dominance (M-Regime): **Fiscal policy exhibits 'Ricardian equivalence';* **Monetary policy follows its inflation target path.*	*Active Monetary Policy*	Monetary authority pursues its inflation target independent of fiscal policies. Tight, contractionary monetary policy
	Passive Fiscal Policy	Fiscal authority determines tax and spending levels, independent of GIBC consideration. Loose and expansionary fiscal policy
Fiscal Dominance (F-Regime): **Fiscal policy exhibits 'non-Ricardian equivalence;* **Fiscal policy significantly affects inflation and price stability;* **Monetary policy ensures public debt stability; FTPL holds.*	*Active Fiscal Policy*	Fiscal authority effects tax and expenditure changes in order to balance the budget intertemporaly. Fiscal policy allows long run unsustainable and excessively budget deficit higher than the sustainable budget deficit. Loose and expansionary fiscal policy.
	Passive Monetary Policy	Monetary authority sets interest rates to accommodate fiscal policy. Loose, expansionary monetary policy

Source: Leeper, (2016)

In an F-regime of fiscal dominance (FD), whenever there is a rise in price level due to expansionary fiscal shock, monetary growth would passively increase equally because the monetary authority is compelled to accommodate the fiscal shock. If the long term government budget balance is to be maintained under this regime in which fiscal policy allows long run unsustainable and excessively high budget deficits, the proposition of

Leeper's model is that inflation target of central bank would be abandoned, and the central bank gives room for the emergence of higher inflation (that is, expansionary monetary policy). This consequently causes the monetary authority to either inflate the public debt or work towards generating seigniorage revenue that could be transferred to the fiscal side (budget). This thus reflect FD as a phenomenon of government's long term sustainability (when primary balance is not kept at equilibrium) and higher inflation is generated (than warranted) and original target of monetary policy is abandoned when loose (passive) monetary policy is adopted. It should be noted that it is an underlying assumption of the FTPL that government's actions are not constrained by budgetary issues; and according to FTPL (which holds in a FD regime), fiscal policy determines prices when there are no budgetary adjustments in response to fiscal shocks affecting the government intertemporal budget constraints (GIBC) thus reflecting the 'non-Ricardian' behaviour in which price is made to adjust to balance the budget constraints. Hence, fiscal policy plays a more important role than monetary policy in ensuring price stability and in determining inflation in a FD regime. Therefore, under such regime, fiscal policy changes must impact the price level regardless of the degree of monetary authority's commitment to price stability. In this 'non-Ricardian' fiscal policy situation, there could be high inflation and price instability. This appears not to be the best option for monetary unions. In an M-regime of monetary dominance (MD), the central bank focuses on its inflation targeting goal while a passive and expansionary fiscal policy is in place to avoid the disruption to fiscal policy long term sustainability. In targeting inflation, if a monetary policy specifies the form and direction of interest rate movement in response to specific inflation and growth deviations, there could be stable/low inflation if fiscal policy is not considered when such fiscal policy displays 'Ricardian' behaviour. This is an instance of the implication of the FTPL. Leeper (1999) considers this policy mix as 'default' and as one that can guarantee stable policy

combination. This is deemed more appropriate for monetary unions. However, when both policies are active, such expansionary fiscal shocks are addressed by monetary policy to some extent.

In the event of monetary integration when the monetary policy formulation will be transferred to a supra-national level and the formulation of fiscal policies (of members states) remains at national levels, the competing views or rather, the interactions of monetary and fiscal policies and how they affect inflation under two conflicting fiscal dominance and monetary dominance regimes are very crucial and relevant for policy makers at both national and supra-national levels within such monetary integrated bloc. Specifically, FTPL could be of interest to monetary unions (and the WAMZ) because it will contribute in revealing and explaining the pattern of price level evolution across such monetary unions, particularly in member states. There are fiscal limitations imposed on existing and proposed members of monetary unions so as to ensure that the 'Ricardian regime' and 'monetary dominance' are appropriately and justifiably institutionalised.

In this assessment, the modelling of monetary policy followed the standard Taylor rule which makes the nominal interest rate to depend on inflation and output gap. In the monetary reaction function, Taylor (1993) proposed short term interest rate as monetary policy instrument in which the conjecture was that there would be increase in the Federal Fund rate if there is increase in inflation above its target or if there is increase in output gap above the value of its trend. The Taylor's modelling of the nominal interest rate rule is simply given as:

$$i = f(\pi + yg) \qquad 5.16$$

where i is nominal interest rate, π is inflation and is yg output gap. Nevertheless, it is worthy of note to state that Taylor (1993) did not perform econometric estimation of the reaction function but only attach equal of value of 0.5 coefficients to inflation and output gap.

Although, results generated in the estimation of the central bank reaction function by Taylor (1993) generated varied results, however, the common interpretation of Taylor rule is that inflation gap's weigh should be greater than unity (1) in order to show that real interest rate is raised by monetary authority in responding to higher inflation and the below-normal level of output requires lower interest rates. Monetary behaviour and the correlation between expected inflation, nominal interest rate and real interest rate (as established by 'Fisher Equation') could both be captured by this empirical relationship linking nominal interest rate with inflation and output.

On the fiscal side, this study applied the fiscal rule suggested by Davig and Leeper (2005, 2013) in which government revenue/GDP ratio reacts to government expenditure ratio, public debt ratio and output gap in the modelling of fiscal policy. This is depicted as:

$$r = f(lb + yg + g) \qquad 5.17$$

Where r is government revenue/GDP ratio, is lb one-period lagged public debt/GDP ratio, is yg output gap and is g government expenditure/GDP ratio. Making fiscal revenue to be function of lagged debt could say something about how revenue (taxes) are raised by fiscal authority to respond to public debt increases and as well establish the positive correlation created by GIBC between public debt and future primary surpluses.

5.4.2 Data and Methods

This study applied monthly data of monetary and fiscal policy rules. These data for the WAMZ countries which span from 2001M1 to 2015M12 were obtained from the databases of IMF World Bank and the Economic Intelligence Unit (EIU). Inflation rate, defined as log difference in GDP deflator was lagged over the past twelve months while public debt GDP was lagged in same manner. The nominal interest rate was taken to be the money market rates for these countries. Output gap was estimated as log deviation of real output from the potential as derived through the application of Hodrick-Prescott (H-P) filtering method with

lambda (λ) = 14,400, which is appropriate for monthly data. Fiscal variables used are government revenue, public debt and government expenditure (all, as share of GDP). All data employed (sourced as annual data) were converted to monthly values using Eviews' 'linear-match' specification. For the monetary policy regime estimations, lagged values of dependent variable (nominal interest rate) was included on the right hand side of the estimated model in order to account for interest rate smoothing. Equally for fiscal regimes, as regressor, lagged value of the dependent variable (revenue/GDP ratio) was included so as to remove possible residual autocorrelation. In these tests of monetary dominance and assessment of the nature of monetary-fiscal policy interactions and to account for possible change in monetary and fiscal regimes in the WAMZ, the econometric estimation method employed is the Markov regime switching regression models of the Taylor monetary rule (augmented by interest rate for smoothing) and of the fiscal rule suggested by Davig and Leeper (2006) augmented with lagged values of government revenue scaled by output. Empirical characterisation of policy behaviour (according to these rules) were established while allowing for regime changes. Monetary and fiscal policy were allowed to switch independent of each other. With the view that there is always discrete shift in policy behaviour, we can differentiate between policy behaviour that is time variant and other equilibrium conditions that do not display time, but which coincides with policy shifts.

The regime switching regression of monetary policy (Taylor rule) estimated for these WAMZ countries is specified in an estimable form as:

$$i_t = \alpha_0(S_t^M) + \alpha_\pi(S_t^M)\pi_t + \alpha_{yg}(S_t^M)yg_t + \alpha_{i_t}(S_t^M)i_{t-1} + \sigma_m(S_t^M)\varepsilon_t^m \qquad 5.18$$

Where i_t is nominal interest rate, π_t is inflation, yg_t is output gap, as the lagged value of interest rate (i_{t-1}) is for interest rate smoothing meant to address interest rate inertia, S_t^M represents the monetary policy regime which follows a two state Markov chain with its transition matrix P^M, while ε_t^m is the disturbance with normal distribution and zero mean.

Independent of the coefficients in the monetary rule, the variance of the error switches between two different values. The assumption here is that parameters α_0, α_π, and α_{yg} are time varying. The variance of the shock is not constant but has Markov-switching property. From the estimation of the above monetary rule, the situation of 'active' monetary policy is established when the coefficient estimates of inflation is greater than one ($\pi_t \geq 1$). Conversely, the monetary rule is 'passive' if this coefficient is less than unity ($\pi_t \leq 1$). Monetary policy stance changes over time. This prompts the question on how the behaviour of fiscal policy would be in the same period. Answer to this question would reveal if these policies are 'accommodative' or 'counteractive' to each other. Therefore, for clear understanding of the policy mix in the six WAMZ countries, it is relevant to equally account for possible changes in fiscal regimes in these countries.

There are two broadly used strands of fiscal policy rules: (i) the fiscal rule in which the value of the primary budget deficit allows public debt ratio stabilisation (Bohn, 1998) ; and (ii) the fiscal rule in which government revenue/GDP ratio reacts to government expenditure ratio, public debt ratio and output gap (Davig and Leeper (2005, 2013). This research applied the second strand. The fiscal counterpart of Equation 5.18 above wreflects the regime switching fiscal policy rule expressed as:

$$r_t = \gamma_0(S_t^F) + \gamma_b(S_t^F)b_{t-1} + \gamma_y(S_t^F)y_t + \gamma_g(S_t^F)g_t + \sigma_r(S_t^F)\varepsilon_t^r \qquad 5.19$$

where r_t is the government revenue/output ratio, b_{t-1} is one-period lagged public debt/output ratio, γ_g is the government expenditure, γ_y is the output gap, ε_t^r is the disturbance term with normal distribution and zero mean while S_t^F is the fiscal regime that follows a Markov chain with transition matrix P^F. The fiscal rule modeling allows the variance of the errors to switch between two values. The assumption here is that parameters $\gamma_0, \gamma_b, \gamma_y$ and γ_g are time varying and that the variance of the shock is not constant but has Markov-switching property.

The Leeper's (1991) FTPL specifies that a fiscal regime is 'passive' when the estimated coefficient of debt/output ratio is positive and statistically significant ($\gamma_b \geq 1$), implying that increase in the stock of outstanding public debt would cause significant reduction in government deficits. On the other hand, an active fiscal policy regime is established if ($\gamma_b \leq 1$); and this is when the fiscal authority is not constrained by the level of public debt. At this point, what was brought into this study was the method of joint matrix estimation proposed by Davig and Leeper (2009) in which the joint transition probability matrix governing the monetary-fiscal regime in the WAMZ was estimated as:

$$P^{MF} = P^{M} \otimes P^{F} \qquad 5.20$$

where P^{MF} is the joint transition matrix which indicates the mix of monetary policy and fiscal policy, reflecting the interactions between the two macroeconomic policies within the WAMZ, P^{M} and P^{F} respectively, are the transition matrix for monetary policy and fiscal policy. From the estimated joint transition matrix, the monetary-fiscal policy interaction could be interpreted as reflected in Table 5.23 below.

Table 5.23: Monetary-Fiscal Policy Mix Implications

	Active Monetary Policy	***Passive Monetary Policy***
Active Fiscal Policy	Explosive	Non-Ricardian (FTPL)
Passive Fiscal Policy	Ricardian	Indeterminacy

Source: Leeper (2007)

The explosive policy mix is unsustainable as both monetary and fiscal policies are 'active'. The indeterminacy mix is when both policies are 'passive'. For monetary unions (in which monetary policy and fiscal policies are at the supra-national and national levels respectively), the 'Ricardian' mix of the interactions between the two macroeconomic policies is deemed to be the best.

5.4.3 Results and Findings

The results of the Markov regime switching regressions for both monetary and fiscal policy regimes in the WAMZ are exhibited in Table 5.24 below.

Table 5.24: Results of Markov Switching Regressions of Monetary and Fiscal Policies Regimes

Monetary Rule Regimes Switching						
Variables	***Gambia***	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Constant:						
State 1:	6.3176*	-0.0366	19.7330*	0.09397*	1.2505*	-0.5700
State 2:	5.3892*	7.9482*	0.6409	0.4074*	6.9404*	9.2570*
Inflation:						
State1	619.9587*	518.8409*	-72.541**	-7.3280	71.9769*	-85.8522*
State 2	358.0398*	436.6295*	171.3730*	48.8968*	-35.7580	728.5705*
Output Gap:						
State1:	-11.6994*	45.3135***	650.8563*	5.1947*	116.4321*	-1780.55*
State 2:	2.8125	-51.4353	98.3488*	-3.8306	228.1941***	142.600**
Interest Rate Smoothing:						
State1:	0.4941*	0.4081*	-0.080***	0.7808*	0.6706*	0.6550*
State 2:	0.4519*	0.4191*	0.6409*	0.5985*	0.6370*	0.0950
Transition Probability:						
P11:	0.95	0.96	0.98	0.97	0.99	0.97
P22:	0.98	0.96	0.97	0.96	0.96	0.96
Expected Duration:						
State 1:	19.78	25.72	60.30	38.56	68.90	29.23
State 2:	44.23	30.67	48.53	26.90	29.85	26.64
Standard Deviation (Sigma):	0.10*	0.47*	0.17*	-1.46*	0.28*	0.82*
AIC:	3.35	4.14	3.45	0.22	3.66	4.86
HQIC:	3.44	4.22	3.53	0.31	3.74	4.95
SBIC:	3.56	4.35	3.66	0.43	3.86	5.07
Log Likelihood:	-270.66	-337.16	-279.03	-8.26	-296.18	-397.54
Fiscal Rule Regimes Switching						
Variables	***Gambia***	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Constant:						
State 1:	4.0109*	0.7454*	11.4237*	19.6979*	4.3896*	4.8721*
State 2:	1.2346**	26.9125*	13.0254*	-6.3574*	0.4661*	4.7851*
Public Debt/GDP:						
State1	-0.004	0.0410*	-0.0010	-0.0090*	-0.0285*	-0.0137*
State 2	0.0169*	-0.1168*	-0.0013*	0.0072	0.0172*	0.0147*
Govt. Expenditure/GDP:						
State1:	0.4894*	0.2129*	0.4771*	0.1843*	0.6292*	0.5313*
State 2:	0.5591*	0.2450*	0.6097*	0.1893*	0.7474*	0.5666*
Output Gap:						
State1:	-30.9041*	82.3639*	271.6433*	25.8408*	-10.9854**	-115.523*
State 2:	-66.8563*	122.8293*	40.1287*	3.0609**	93.8618*	-59.907*
Lagged Govt. Revenue/GDP:						
State1:	0.2409*	0.5986*	-0.6623	0.1430	-0.2579*	0.0163
State 2	0.2043*	-0.5109	-0.2850*	1.0290*	-0.0949**	-0.0465
Transition Probability:						
P11:	0.97	0.98	0.96	0.97	0.98	0.94
P22:	0.97	0.97	0.98	0.97	0.99	0.96
Expected Duration:						
State 1:	37.25	55.01	25.99	30.51	62.10	17.40
State 2:	48.54	35.38	61.60	29.82	125.16	27.55
Standard Deviation (Sigma):	-0.47*	-1.71*	-4.10	-0.52*	-4.82*	-1.18
AIC:	2.23	-0.25	2.30	2.15	0.08	0.87
HQIC:	2.33	-0.16	2.39	2.25	0.18	0.87
SBIC:	2.47	-0.01	2.54	2.39	0.33	1.12
Log Likelihood:	-174.33	34.36	-179.93	-167.44	5.87	-60.64

Source: Author's Estimation and EViews 9.5 Output

As reflected in the results of the maximum likelihood estimations of Markov switching monetary and fiscal regimes, active and passive regimes across the WAMZ can be determined. State of variance (as measured by standard deviation for the policies parameters) are not uniform but all positive and significant at 1% level under monetary policy regime and all negative and significant at 1% except in the cases of Guinea and Sierra Leone.

In monetary policy Regime 1, monetary policy is active only in The Gambia, Ghana and Nigeria and active in all the WAMZ countries except Nigeria in Regime 2 as highlighted in the reaction of nominal interest rate to inflation. These results are statistically significant at 1% and 10% levels of significance apart from Liberia in State 1 and Nigeria in State 2. The estimation results showed high transition probabilities (of between 0.95 and 0.98) of staying in Regime 1 and Regime 2. Nigeria, the lead economy in the monetary zone exhibits the highest duration of 68.90 months of staying in State 1, while The Gambia came up with the highest duration is State 2. Interest rate smoothing was positive (except in Guinea) and statistically significant across the WAMZ. The log likelihood values were between -8.26 and -397.54. From the results of the maximum likelihood estimations of fiscal policy Markov regime switching, fiscal policy was passive in Regime 1 and Regime 2 in all the WAMZ countries, though not statistically significant in the cases of The Gambia and Guinea (in State 1) and Liberia (in State 2) as reflected in the response of government revenue to public debt. In fiscal regime switching estimation across the WAMZ, the probability of staying in both regimes are very high between 0.94 and 0.99, just as obtained in the monetary rule estimations. As evident in the monetary regime, Nigeria (the lead economy) also demonstrated the longest expected duration of staying in both fiscal policy regimes with log likelihood values of 5.87. However, it is shown that Guinea, Ghana and Liberia recorded high and statistically significant attention of fiscal authorities to output stabilisation in State 1 while such attention were given by Ghana, Nigeria and Guinea in State 2. This shows that

Guinea has the possibility of consistency in fiscal attention to output stabilisation. The likelihood values are within the space of 5.87 and -179.93 in the fiscal regime estimations.

The summary the outcome the Markov regime switching regression of the WAMZ countries in the two regimes are displayed in Table 5.25 below.

Table 5.25: Monetary-Fiscal Policy Mix Implications for the WAMZ Countries

Regime 1			
Country	***Monetary Regime***	***Fiscal Regime***	***Implications***
The Gambia	Active	Passive	*Monetary Dominance (Ricardian)*
Ghana	Active	Passive	*Monetary Dominance (Ricardian)*
Guinea	Passive	Passive	*Indeterminacy*
Liberia	Passive	Passive	*Indeterminacy*
Nigeria	Active	Passive	*Monetary Dominance (Ricardian)*
S/Leone	Passive	Passive	*Indeterminacy*
Regime 2			
Country	***Monetary Regime***	***Fiscal Regime***	***Implication***
The Gambia	Active	Passive	*Monetary Dominance (Ricardian)*
Ghana	Active	Passive	*Monetary Dominance (Ricardian)*
Guinea	Active	Passive	*Monetary Dominance (Ricardian)*
Liberia	Active	Passive	*Monetary Dominance (Ricardian)*
Nigeria	Passive	Passive	*Indeterminacy*
S/Leone	Active	Passive	*Monetary Dominance (Ricardian)*

Source: Author's Estimations

This summary reveals that in both regimes, only The Gambia and Ghana exhibit monetary dominance (the Ricardian Equivalence) with is the strongest and best option for membership of a monetary union. Although, the monetary zone's lead economy, Nigeria displays monetary dominance in Regime 1, the country shows an indeterminacy status in Regime 2. All the WAMZ countries (except Nigeria) exhibit monetary dominance in Regime 2. None of the WAMZ countries simultaneously demonstrates the 'indeterminacy' or the 'explosive' status in both regimes. Given the implications of the monetary-fiscal policy interactions in the mix (in both regimes), one point to highlight regarding the switching is that the probability of switching from one regime to the other is very low across the WAMZ, while by implications, the probability of remaining in any of the two regimes is very high between 0.94 and 0.99.

Table 5.26: Monetary and Fiscal Policies Regimes Transition Probability Matrices of the WAMZ Countries

Country	*Regimes Transition Matrices*
Gambia	$P^M = \begin{bmatrix} 0.9494 & 0.0506 \\ 0.0226 & 0.9774 \end{bmatrix}$ $P^F = \begin{bmatrix} 0.9732 & 0.0268 \\ 0.0206 & 0.9794 \end{bmatrix}$ $P^{MF} = P^M \otimes P^F = \begin{bmatrix} 0.9239 & 0.0254 & 0.0492 & 0.0013 \\ 0.0196 & 0.9298 & 0.0010 & 0.0495 \\ 0.0220 & 0.0006 & 0.9521 & 0.0262 \\ 0.0005 & 0.0221 & 0.0201 & 0.9573 \end{bmatrix}$
Ghana	$P^M = \begin{bmatrix} 0.9411 & 0.0389 \\ 0.0326 & 0.9674 \end{bmatrix}$ $P^F = \begin{bmatrix} 0.9818 & 0.0182 \\ 0.0283 & 0.9717 \end{bmatrix}$ $P^{MF} = P^M \otimes P^F = \begin{bmatrix} 0.9436 & 0.0175 & 0.0382 & 0.0007 \\ 0.0272 & 0.9339 & 0.0011 & 0.0378 \\ 0.0320 & 0.0005 & 0.9498 & 0.0176 \\ 0.0009 & 0.0317 & 0.0274 & 0.9400 \end{bmatrix}$
Guinea	$P^M = \begin{bmatrix} 0.9834 & 0.0166 \\ 0.0206 & 0.9794 \end{bmatrix}$ $P^F = \begin{bmatrix} 0.9615 & 0.0385 \\ 0.0162 & 0.9838 \end{bmatrix}$ $P^{MF} = P^M \otimes P^F = \begin{bmatrix} 0.9455 & 0.0006 & 0.0160 & 0.0006 \\ 0.0159 & 0.9674 & 0.0003 & 0.0163 \\ 0.0198 & 0.0007 & 0.9417 & 0.0377 \\ 0.0003 & 0.0203 & 0.0159 & 0.9635 \end{bmatrix}$
Liberia	$P^M = \begin{bmatrix} 0.9741 & 0.0259 \\ 0.0372 & 0.9628 \end{bmatrix}$ $P^F = \begin{bmatrix} 0.9672 & 0.0328 \\ 0.0335 & 0.9665 \end{bmatrix}$ $P^{MF} = P^M \otimes P^F = \begin{bmatrix} 0.9421 & 0.0319 & 0.0251 & 0.0008 \\ 0.0326 & 0.9415 & 0.0009 & 0.0250 \\ 0.0358 & 0.0012 & 0.9312 & 0.0316 \\ 0.0012 & 0.0360 & 0.0322 & 0.9305 \end{bmatrix}$
Nigeria	$P^M = \begin{bmatrix} 0.9855 & 0.0145 \\ 0.0335 & 0.9665 \end{bmatrix}$ $P^F = \begin{bmatrix} 0.9839 & 0.0161 \\ 0.0080 & 0.9920 \end{bmatrix}$ $P^{MF} = P^M \otimes P^F = \begin{bmatrix} 0.9696 & 0.0159 & 0.0143 & 0.0002 \\ 0.0079 & 0.9776 & 0.0001 & 0.0144 \\ 0.0330 & 0.0005 & 0.9509 & 0.0156 \\ 0.0003 & 0.0332 & 0.0077 & 0.9588 \end{bmatrix}$
S/Leone	$P^M = \begin{bmatrix} 0.9658 & 0.0342 \\ 0.0375 & 0.9625 \end{bmatrix}$ $P^F = \begin{bmatrix} 0.9425 & 0.0575 \\ 0.0363 & 0.9637 \end{bmatrix}$ $P^{MF} = P^M \otimes P^F = \begin{bmatrix} 0.9103 & 0.0555 & 0.0322 & 0.0020 \\ 0.0351 & 0.9307 & 0.0012 & 0.0330 \\ 0.0353 & 0.0022 & 0.9071 & 0.0553 \\ 0.0014 & 0.0361 & 0.0349 & 0.9276 \end{bmatrix}$

Source: Author's Estimation and Eviews 9.5 Output

The transition probability matrices of the two regimes of monetary policy and fiscal policy across the WAMZ over the estimation period is displayed in Table 5.26 above. This is the joint transition probability matrices estimation of Equation 5.23 for the six countries over the period covered by the study. The joint regime transition probability matrices reflect very high probabilities of remaining in both regimes. These probabilities are in 90% percentages as shown in the estimations.

5.5 Expected Loss of Monetary Independence

It is not automatic for a country joining a monetary union to lose its monetary autonomy. The notion is that one cannot lose what he/she does not have, (or rather he/she can only lose what he/she has), so likewise a country. And so, by the implication of the domineering effect of the large economy of Nigeria in the WAMZ, countries making up the proposed monetary union can only lose monetary autonomy only if they actually have such autonomy, away from the influence of the anchor country's (Nigeria) monetary policy or rather if their respective monetary policy is independent of the policy of this possible anchor economy.[95]

During the EMU formation period, there were views that when a country abandons its own national currency (for a common currency), there would be a loss of a policy instrument.[96] Countries joining a monetary union are expected to incur economic cost of formally adopting a common monetary policy by joining the full monetary union. In this research study, this hypothesis is interestingly tested in the context of the WAMZ countries and the dominance of Nigeria within the monetary zone. For the WAMZ's five smaller economies, a simple

[95] Given the size of the economy of Nigeria, which is close to 90% of the entire GDP of the WAMZ, this study consequently regards Nigeria as the potential anchor country for the proposed monetary zone; and for this reason, the evaluation of the nature of the reactions of monetary policies of other WAMZ economies to Nigeria's monetary policy was carried out.

[96] There were counter opinions in the context of Eurozone creation, indicating that such view was as 'unreal'.

McCallum monetary base related model, augmented with Nigerian policy variable, is built and appropriately employed in testing the hypothesis in order to determine the degree of monetary policy independence loss by the five WAMZ countries. Instead of nominal interest rate, McCallum rule applies monetary base as a monetary policy instrument due to: (a) the ease of control of monetary base variable by the monetary authority; and (b) the ambiguity in contracting or expanding the monetary policy stance when interest rate is the applied monetary policy tool.

Because of the dominance of the Nigerian Naira within the proposed monetary zone, this test would check if the change in monetary base of other five members are driven by the change in the Nigerian monetary base. The determining logic is that the higher the degree of the influence of the Nigerian monetary base change on a WAMZ country's base money supply change, the lower the degree of loss of monetary autonomy on eventual formation of the monetary union. This investigation into the expected loss (indirectly to Nigeria, a possible lead country) of monetary independence is the objective of this monetary perspective section. The research question answered here was about the level of monetary independence that would be conceded by the other five WAMZ countries to the lead economy.

5.5.1 Theory and Models

Coming from the McCallum monetary base theoretical underpinnings, the model built and applied centred on how the five smaller economies within the WAMZ (The Gambia, Ghana, Guinea, Liberia, and Sierra Leone) respond to changes in monetary base of the possible anchor economy, Nigeria as expressed, reflects the elongation (on the right hand of the model) with the Nigerian base money supply changes, is given as:

$$\Delta m_t = (\pi_t - \pi^*)_t + (y_t - y_t^*)_t + \Delta m_t^N \qquad 5.21$$

Where $(y_t - y_t^*)_t$ is the output gap at time t, $(\pi_t - \pi^*)_t$ is the inflation deviation at t, Δm_t^N is the potential anchor monetary base growth rate (that is, monetary base of Nigeria) while Δm_t is monetary base change in the five smaller WAMZ countries at time t. There have been strong supports for lagged variables to be more appropriate in yield unbiased results.

5.5.2 Data and Methods

Annual data of base money, nominal GDP and inflation were collected for the six WAMZ countries from the EIU database. These data span between 1980 and 2014. The HP filtering method (at lambda=100) was employed to derive the potential output towards estimating output gaps while the 5% inflation convergence criterion rate was applied in the estimation of inflation of the WAMZ countries from targets. Consequent upon the macroeconomic modelling expressed above, for the purpose of determining the expected loss of monetary independence by the five smaller WAMZ economies, the contemporaneous and backward-looking monetary base econometric functional equation estimated with simple OLS method are specified as:

$$\Delta m_t = \alpha + \beta_1(\pi_t - \pi^*)_t + \beta_2(y_t - y_t^*)_t + \beta_3 \Delta m_t^N + \varepsilon_t \quad 5.22$$

and

$$\Delta m_t = \alpha + \gamma_1(\pi_t - \pi^*)_{t-1} + \gamma_2(y_t - y_t^*)_{t-1} + \gamma_3 \Delta m_{t-1}^N + \varepsilon_t \quad 5.23$$

In these models, for the purpose of meeting the research objectives here, the parameters of interest are β_3 and γ_3. The estimation of Equations 5.22 and 5.23 were carried by OLS regression method.

5.5.3 Results and Findings

The results of the estimations of the two augmented McCallum monetary base models for the WAMZ's smaller economies are as displayed in Table 5.27 below.[97] Generally, in both estimations, the standard errors are low in the cases of The Gambia and Liberia while the coefficient of determination (R-Squared) is at the lowest in Guinea which also lacks joint significance at 5%. The results of interest are those yielded for the response of the monetary policy changes in these smaller WAMZ economies to the anchor country's (Nigerian) monetary policy changes.

Table: 5.27: Monetary Reactions to Anchor Country's (Nigerian) Monetary Base Change (1980-2014)

Contemporaneous Augmented McCallum Monetary Base Model					
Dependent Variable: ***Change in Monetary Base***					
	Gambia	***Ghana***	***Guinea***	***Liberia***	***S/Leone***
ΔNigerian Monetary Base:	0.0004*	1.4473*	0.2221**	0.0010*	0.1119*
	(0.0001)	(0.1253)	(0.1067)	(0.0012)	(0.0224)
Output Gap:	-0.0001	-0.0216	1.6752	0.0001	0.0895
	(0.0002)	(0.1445)	(5.7172)	(0.0003)	(0.2544)
Inflation Deviation:	-0.0017	-3.4812	14.642***	0.0162	-0.4252
	(0.0021)	(3.8976)	(8.3557)	(0.0216)	(0.4131)
R^2*:*	0.49	0.83	0.26	0.53	0.54
F-probability:	0.00	0.00	0.09	0.00	0.00
Observations:	34	34	25	32	34
One-period Lagged Augmented McCallum Monetary Base Model					
Dependent Variable: ***Change in Monetary Base***					
	Gambia	***Ghana***	***Guinea***	***Liberia***	***S/Leone***
ΔNigerian Monetary Base:	0.0006*	1.3888*	-0.2670	0.0015*	0.1547*
	(0.0001)	(0.3725)	(0.1782)	(0.0004)	(0.0372)
Output Gap:	-0.0010	-0.0168	-9.9120	0.000	0.1044
	(0.0002)	(0.2827)	(6.1776)	(0.0003)	(0.2770)
Inflation Deviation:	-0.0001	-6.7631	-2.871	0.0017	-0.4712
	(0.0020)	(7.6524)	(8.8374)	(0.0266)	(0.4563)
R^2*:*	0.55	0.37	0.16	0.42	0.46
F-probability:	0.00	0.00	0.30	0.00	0.00
Observations:	33	33	31	31	33

Source: EIU and IMF databases, Author's Estimations and Stata 14 Output.

Notes: The standard errors are in parentheses. * indicates significance at 1% significant level, ** at 5% significance level and *** at 10% level of significance.

[97] Except for Guinea's 1987-2014 period.

These are significant at 1% and 10% levels of significance. It could be observed from the results that while output gap and inflation deviation were statistically insignificant at 5% level of significance (except for Guinea), the Nigerian policy stance mostly have positive influence on monetary policies in all the five WAMZ countries. As expressed above, the degree of loss of monetary independence is low when the extent of the influence of Nigerian monetary base change is high.

From the contemporaneous McCallum model results Ghana, Guinea and Sierra Leone demonstrated the lowest degree of expected loss of monetary autonomy because the Nigerian policy influence is higher in these two countries. For Guinea, the joint significance is at 0.09 while the coefficient of determination (R^2) reflecting the goodness of fit stands at the lowest of 0.26, casting doubt over the ability of the Nigerian monetary policy instrument to explain the Guinea monetary policy stance. On the other hand, The Gambia had the comparatively highest measure of expected loss of monetary policy autonomy, followed by Liberia. The results of the estimated lagged augmented McCallum model again revealed Ghana, Guinea and Sierra Leone as exhibiting low degree of expected loss of monetary independence. Interestingly, this results showed that at the negative coefficient of -0.2670 (not significant), the Guinean monetary policy was not influenced by the Nigerian policy. Again, the ability of the independent variables to explain the variations in the Guinean case is minimal at a very low R^2 coefficient of 0.16 and F-probability of 0.30. The Gambia and Liberia, again display the higher degree of expected monetary independence loss, given their lower coefficient of the influence of the change in the Nigerian monetary base as policy instrument. Owing to the developing nature of African economies and the slow reactions of macroeconomic variables in the developing nations, greater emphasis are placed on results generated through the estimation of the lagged McCallum monetary base growth model for these WAMZ countries.

The summary of the findings here is that the degrees of the expected loss of monetary independence would be high in The Gambia and Liberia, with the implication of high costs of monetary integration for the two countries. The extent of this loss would be low in the cases of Ghana and Sierra Leone, thus signifying low cost of monetary integration for the two countries.

5.6 Suitability of Common Monetary Policy

Moving from the conclusions of the immediate previous section on the extent of the expected loss of monetary autonomy for prospective members of the WAMZ, this section focuses on the investigation of the suitability of the expected common monetary policy for these countries. The objective here is to construct Monetary Policy Suitability Indicators (MPSI) for these WAMZ countries and show the ranking of the levels of adequacy or sustainability of a single monetary policy for the proposed monetary union, within the contexts of economic sizes and levels of base money supply. Results generated here are indicators of ease of monetary integration for the WAMZ member countries.

5.6.1 Theory and Model

McCallum (1988) stressed the principles necessary for the design of a monetary rule that: (i) a monetary rule should be able to dictate the behaviour of a variable that can directly and accurately be controlled by the monetary authority, and further that the behaviour of some magnitude which are not controllable (such as the M1 measure of the money stock for instance) leaves the task of rule design seriously incomplete; (ii) monetary rule should not rely essentially on the presumed absence of regulatory change and technical progress in the financial industry; (iii) the paths of both money stock and (nominal) interest rate are not important for their own sakes because they are only of relevance to the extent that they are useful in facilitating good performance of output and inflation; (iv) a monetary rule should be

well designed. In qualitative terms, McCallum proposed a rule that reflects these four principles. A principal feature of the McCallum rule is the use of monetary base (rather than nominal interest rate in the Taylor rule) as a monetary policy instrument. The argument brought forward by McCallum in this respect is that tightening or easing of the policy stance are ambiguous when the nominal interest rate is applied as monetary policy stance indicator; and consequently because the monetary authority can control the monetary base variable with very high degree of accuracy, this monetary base policy rule is 'desirably operational'. McCallum hypothesise that monetary rule periodically adjusts the growth rate of base money. The base money would increase if nominal GDP is below its target path and vice versa. In its functional form, the McCallum monetary rule is stated as:

$$\Delta m_t = \Delta x^* - \Delta V_t^a + \lambda(\Delta x^* - \Delta x_{t-1}) \qquad 5.24$$

where is Δm_t base money growth rate, $\Delta x^*$is the nominal GDP growth rate target which is constant, estimated as the sum of long run average real GDP growth rate and inflation rate target, ΔV_t^a is the average base money velocity estimated by dividing base money by nominal GDP, and $(\Delta x^* - \Delta x_{t-1})$ is the deviation of nominal growth rate. This base money growth rate rule is however within the inflation targeting framework. Because $(\Delta x^* - \Delta x_{t-1})$ depicts pressure on inflation, an economy would display 'overheating' if the rate of GDP growth is higher than the rate of inflation target, prompting reduction in the base money growth. The McCallum rule is thus an automatic stabiliser in which the growth rate of money base is the monetary policy instrument here. The value of coefficient (λ) has to be chosen and fixed in order to give adequate responsiveness of base money growth to departures of nominal GDP from its target path, and prevent the induction of dynamic instability that can cause 'too strong' feedback effects. Therefore, a carefully fixed coefficient (λ) would give automatic adjustment to the money base and growth rates in a way that would on average, yield zero inflation in reaction to base 'velocity' alterations caused by regulatory or technical

changes. For ΔV_t^a (average base velocity), McCallum used a four-year period, 4.5% for Δx^* (the nominal GDP growth rate target) and assumed a value of 0.5 for (λ), which is the coefficient of nominal growth rate deviations. In terms of aggregate demand, even with drastic changes in this form, increase in monetary base changes would make monetary policy to be expansionary, while on the other hand, there would be contractions when monetary policy changes decrease. The McCallum monetary policy rule equation indicates that the growth of monetary base depends on the three terms on the right hand side of Equation 5.24. The first term is a constant which is the combination of the desired inflation plus the potential GDP growth. The second term, the monetary base velocity growth rate which assists in preventing the price level from drifts that may be caused by its response to money demand permanent shock. Under the assumption that monetary policy is neutral in the long run, if the growth rate of base money velocity is steady while the level of nominal GDP and its targets are at par, inflation rate would be forced to its target by this monetary rule. The third term stabilises the properties of the McCallum rule. Whenever the nominal GDP deviates from target, monetary authorities are prompted to adjust the growth of monetary base.

Basically, there are some characteristics of the McCallum monetary policy rule. First is the preference of nominal GDP over monetary aggregates (like M1 and M2) as the principal target variable of the monetary authority, since the nominal GDP exhibits correlation with real GDP and inflation. Furthermore, within the nominal GDP targeting system, the nominal GDP shows some traits that makes it in principle, to be a good guide in monetary policy decision making as monetary policy adjusts to offset aggregate demand disturbances and as it helps the monetary authority to strike the balance between the inflation and output growth stability objectives when the response to aggregate supply disturbances are to be recognised. The preference of the nominal GDP over real GDP in this rule is borne out of the view that the monetary authorities can neither accurately control nor predict how the nominal GDP

growth divides between inflation and real growth. The second element of the McCallum rule is the introduction of a constant growth target for nominal income instead of variation in target rate over the cycle. This is likely to remove unwanted fluctuations caused by policy surprises emanating from the pursuit of an optimal monetary policy decisions by the central bank. As a novel effort here, rather than simply choosing or fixing values of 0.5 for (λ), the coefficient of nominal GDP deviation as McCallum did, this coefficient for individual WAMZ countries were generated through econometric procedures in order to capture the actual behaviour of the related macroeconomics of the WAMZ's member countries. The 5% inflation target in the WAMZ's convergence criteria was applied. In consideration of these and the respective country's constant (the GDP growth rate target) and the base money velocity in describing the monetary policy of the WAMZ member countries, the country-by-country specific monetary base growth rates are therefore expressed as:

$$\text{The Gambia: } \Delta mGM_t = 8.3 - \Delta V_t^a + \lambda(8.3 - \Delta x_{t-1}) \quad 5.25$$

$$\text{Ghana: } \Delta mGH_t = 11.6 - \Delta V_t^a + \lambda(11.6 - \Delta x_{t-1}) \quad 5.26$$

$$\text{Guinea: } \Delta mGU_t = 8.2 - \Delta V_t^a + \lambda(8.2 - \Delta x_{t-1}) \quad 5.27$$

$$\text{Liberia: } \Delta mLB_t = 11.2 - \Delta V_t^a + \lambda(11.2 - \Delta x_{t-1}) \quad 5.28$$

$$\text{Nigeria: } \Delta mNG_t = 10.8 - \Delta V_t^a + \lambda(10.8 - \Delta x_{t-1}) \quad 5.29$$

$$\text{Sierra Leone: } \Delta mSL_t = 8.8 - \Delta V_t^a + \lambda(8.8 - \Delta x_{t-1}) \quad 5.30$$

5.6.2 Data and Methods

Annual data spanning over the 25-year period between 1990 and 2014 for real GDP, nominal GDP, inflation (GDP deflator), base money (M1), annual growth and US dollar nominal exchange rates were applied in this evaluation. The actual real output data was taken as the real GDP seasonally adjusted in US dollars at 2006 price, expressed in logarithmic form. Potential output was determined by fitting a time trend to actual output. Inflation rate was taken as the year-on-year changes in inflation calculated with the GDP deflator. The inflation

target of 5% (as prescribed for all the WAMZ countries as a primary convergence criterion) was adopted as inflation target for all and with this, deviations of the actual inflation rates from this inflation target were calculated for each member country of the zone. The velocity of the base money variable was constructed by dividing the nominal GDP by base money (M1) while the constant, the nominal GDP growth rate target was an addition of the WAMZ convergence criteria inflation target of 5% and average real GDP of each country over the 25 years covered by the study. For the purpose of computing the average weight employed here, the WAMZ countries' levels of base money supply at the end 2014, expressed at the local currency units, were converted to the US dollar units at the 2014-year-end nominal exchange rates. This study applied a five-stage process towards determining the suitability of single monetary policy in the WAMZ.

At the first stage, the annual short-term counterfactual base money growth rates, according to the McCallum monetary rule specifications in Equations (5.25 to 5.30) were estimated for the WAMZ countries. At the second stage, averages of the estimated counterfactual monetary base growth were calculated for each WAMZ country in order to identify the potential members of the proposed currency union. The rule here is that countries exhibiting similar monetary base growth rates would have the prospect of forming a sustainable currency union on the long run. Given the fact that the WAMZ is yet to take off as monetary union with a common central bank, area-wide counterfactual monetary base growth rates were calculated for the entire monetary zone in stage three. This was based on weighted average of WAMZ member country's base money growth rates. The weighted average takes care of the view that when members of a monetary union lose monetary independence, the setting of interest rates and the determination of money supply growth for the monetary union were meant to serve the interest of countries that have high levels of influence on others. In this respect, the average of the 2014 current GDP (in US dollars) for each WAMZ member country and their

respective end of 2014 level of base money supply (converted to US dollars) were applied as the indicator of weight. The area-wide counterfactual money supply growth rate for the WAMZ as a proposed monetary union was consequently estimated with the following derived equation:

$$mWAMZ_t = \Sigma(W_C . m_{ct}) \quad 5.31$$

where $mWAMZ$ is the area-wide counterfactual money supply growth for the WAMZ, W_C is the weight of each WAMZ country, which is the country's GDP share of the total of the GDP of the six countries in the monetary zone, and m is the monetary base growth rate (calculated in stage one). At the fourth stage, the annual stress levels for each member countries of the WAMZ were calculated as the difference in the respective country's annual monetary based growth rate and the monetary zone's area-wide monetary growth rate both estimated as:

$$S_t = m_t - mWAMZ_t \quad 5.32$$

where m_t is the country's annual monetary based growth rate at time t and $mWAMZ_t$ is the area-wide base money growth rate for the WAMZ at time t. To determine the extent of single monetary policy adequacy and suitability for the WAMZ countries and make comparisons, monetary policy suitability (MPS) indicators were constructed (for each country) by estimating the inverse of the mean squared stress indicator for each country under the money supply growth rate monetary rule thus:

$$MPS = \left(\frac{1}{\left(\frac{\sum_{t=1}^{T} (m_t - mWAMZ)^2}{T} \right)} \right) X\ 100 \quad 5.33$$

where MPS is the monetary policy suitability indicator, while T is the number of years. The rule is that the higher the indicator, the more likely the suitable a common monetary policy would be.

5.6.3 Results and Findings

The country-by-country weight employed in this study as derived from average of the 2014 nominal GDP (in US dollars) and the 2014 year-end total money supply (M1) (converted into US dollars with the exchange rate at the end of 2014) is displayed in Table 5.28 below showing Nigeria as having the heaviest average weight of 87% depicting crucial and landmark implications for the determination of the counterfactual and future monetary policy stance of the proposed common central bank. These depict the economic sizes of these countries. The Gambia has the lowest average share of 0.3%.

Table 5.28: WAMZ Countries' Weights (as derived from the 2014 Nominal (US dollars) GDP)

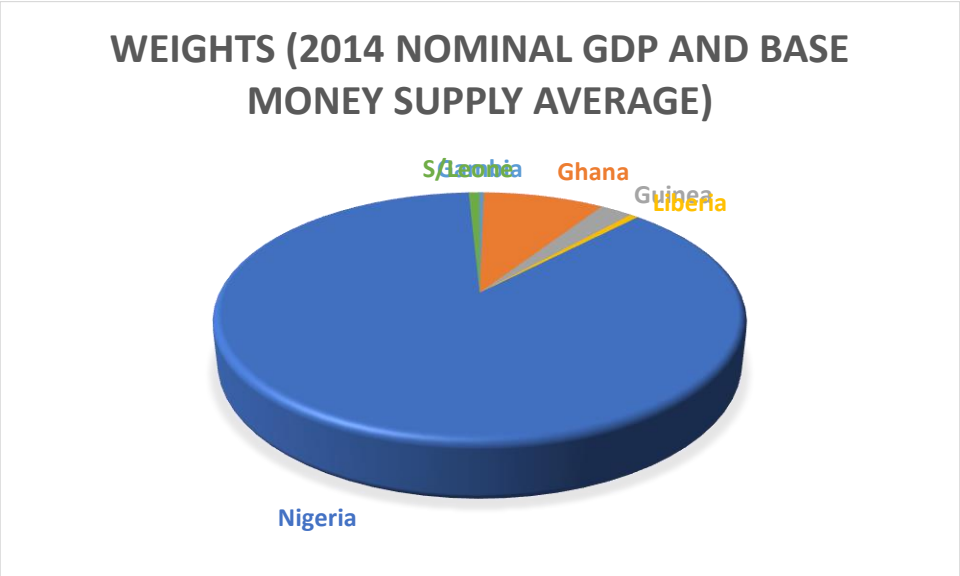
Determinant	***Gambia***	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Nominal GDP	0.001	0.062	0.011	0.003	0.915	0.008
Base Money	0.005	0.115	0.037	0.009	0.825	0.009
Average Weight	**0.003**	**0.089**	**0.024**	**0.006**	**0.87**	**0.008**

Source: EIU and IMF databases and author's estimations and EViews 7 Output

As stated earlier, with the loss of monetary independence by member states of a monetary union, the determination of the money supply and money supply growth for the entire union would reflect the interests of countries demonstrating high degree of influences on other members. In the case of the WAMZ, the weight displayed by Nigeria is heavy enough for the country to influence monetary policy decisions (including other financial and economic decisions) within the proposed currency union.

A diagrammatic representation of weights exhibited by each member country of the WAMZ is as shown in Figure 5.1 below in which it is clearly glaring that Nigeria takes the 'lion-share' of all:

Figure 5.1: Chart of Applied Weight of the WAMZ Countries (Average 2014 Nominal GDP and Money Supply)



For the results generated by this study to closely reflect the macroeconomic actuals and developments within the monetary zone, the weight/coefficients of indicators in the equations applied in deriving the monetary rule base money growth rates were generated by OLS regressions of related equations and displayed in Table 5.29 below thus:

Table 5.29: Econometric Derivation of Weights for Nominal Growth Deviation

	Gambia	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*S/Leone*
Growth Deviation	-0.1	-0.9	-1.6	0.2	-0.2	-0.4

Source: EIU and IMF databases and author's estimations and Eviews 7 Output

Table 5.30: Estimated Monetary Policy Suitability Indicators

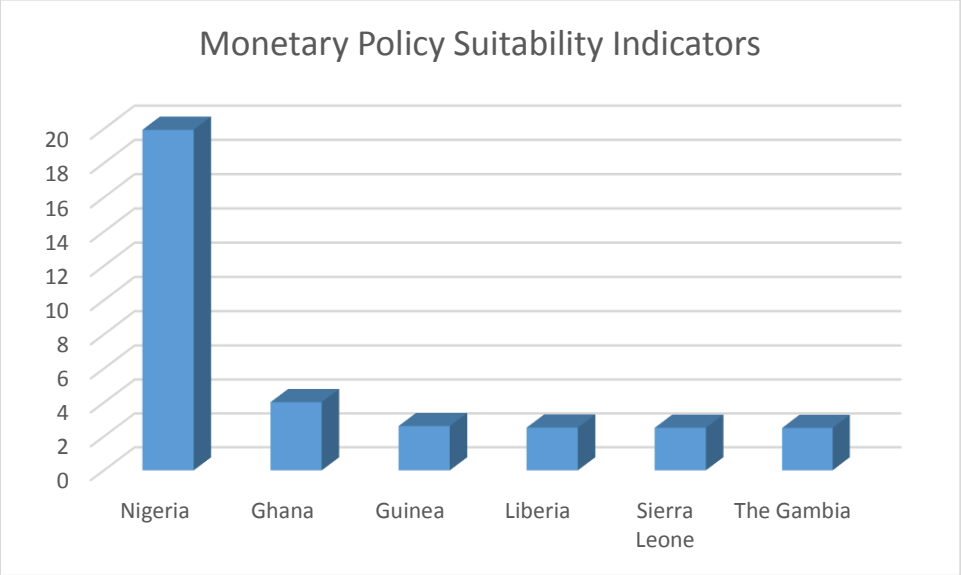
WAMZ Country	*MPS Indicator*
Nigeria	19.94
Ghana	4.02
Guinea	2.61
Liberia	2.52
Sierra Leone	2.51
The Gambia	2.50

Source: Author's estimations

The degrees of suitability of the future single/common monetary policy for the WAMZ countries revealed by the results of the estimated Monetary Policy Suitability Indicators (MPSI) applying Equation 5.33 are exhibited in Table 5.30 above:

The rule is that the higher the MPSI, the more suitable the common monetary policy will likely be for national stability and the easier the integration into the monetary union. Nigeria, with a wide gap, at the top while The Gambia at the base may not find the single monetary policy adequate for the achievement of their respective national monetary policy goals. The results in Table 5.30 suggest the order in which the six WAMZ countries would be at ease in joining the proposed monetary union and find the single monetary policy suitable. Graphical representations of the country-by-country stress indicators are presented in Figure 5.2 below.

Figure 5.2: Chart of Monetary Policy Suitability Indicators for the WAMZ Countries



From the analyses, there are evidence to suggest that Nigeria has an enormous influence over the other five members of the proposed currency union, given the size of her economy as well as the level money supply. There is strong likelihood for Nigeria to be the major determinant of the single monetray policy stance within the WAMZ. There are evidences to suggest that Nigeria is solely guarenteed to find the monetary integration easy as well as the single

monetary policy adequate for her national stability in light of this specific monetary perspective.

5.7 Conclusions

Towards achieving the aim of this thesis, this chapter applied the monetary perspectives of money neutrality, monetary reactions, monetary dominance, monetary independence and common monetary policy suitability in the evaluation of the monetary integration of the WAMZ. Various models and estimation methods of relevance were applied. The monetary neutrality which analysed money supply in respect of output, inflation and output growth revealed non-neutrality and non-superneutrality of money in virtually all the WAMZ countries under assessment. These are results positive enough to give the evidences that suggest that a single monetary policy (of money supply as policy instrument) will suffice for the WAMZ's monetary integration in achieving future policy objectives and economic stability with the proposed monetary zone. Employing both annual and monthly data, the monetary reactions assessments revealed some dissimilarities across the WAMZ with high degrees of statistical insignificance. The results of the monetary reaction assessments gave evidences to suggest that it may take long term adjustment for a single monetary policy to be suitable for all the six countries at a time. Consequently, all things being equal and if past behaviour of the macroeconomic variables evaluated for the WAMZ countries are factors to reckon with, a single monetary policy may not be suitable for the future monetary zone, because of the diverse forms of reaction of the monetary policy instrument to inflation and output revealed by the more preferred higher frequency monthly data estimations. The evaluation of monetary dominance with the Markov switching regression estimations of monetary-fiscal policies interactions revealed good incidences of monetary dominance necessary for monetary integration of the WAMZ. Fiscal policies were reported to be passive all through while monetary policies were mostly active in the two-state Markov analyses. A

displeasure was found in the 'indeterminacy' stance of Nigeria in the second regime. Nevertheless, the probability of transition between the regimes were reported to be high. These results are fairly in favour of monetary integration of the WAMZ. The investigations into the degree of expected losses of monetary independence by WAMZ member economies produced evidences to suggest that the degrees of the expected loss of monetary independence will be high (at high costs) in The Gambia and Liberia, while the extent of this loss would be low (at low costs) in the cases of Ghana and Sierra Leone. The assessments of the suitability of a single monetary policy for all WAMZ members revealed the huge influence of Nigeria over five other members of the WAMZ. It was evidently proved that Nigeria will be a major determinant of the future common monetary policy stance in the proposed monetary integration. This suggests that Nigeria is solely guarenteed to find the monetary integration beneficial; as well as find the single monetary policy adequate for her national stability. This is a factor not good enough for other members of the WAMZ and the proposed monetary integration project. This had been major concern in literature on the WAMZ as an OCA (Benassy-Quere and Coupet, 2003; and Bankage, 2008).

Generally findings and conclusions from the monetary perspectives assessments are mixed, the evidences produced in this chapter still point to a general conclusion that the WAMZ may not likely be in a successful future monetary integration. Apart from money neutrality and the monetary dominance evaluation that yielded supports for the monetary integration, the huge size and the expected enormous influence of Nigeria is a negative factor, even as there were reported monetary reaction dissimilarities.

Chapter 6

Exchange Rates Behaviour Perspectives

6.1 Introduction

When the investigation of exchange rate behaviour is embedded into monetary integration feasibility study, this constitutes extension and further alternative to studies on optimality of such monetary integration. It is not an attempt to replace the established criteria of an OCA and neither does it provide further 'optimality' criterion. Such research exercise is about overcoming some drawbacks identified within the OCA framework. In determining an OCA, there had been flaws in past evaluations of cross-country interdependence of foreign exchange markets (as related to exchange rates/markets behaviour). These defects were caused by the failure to investigate trends of behaviours and volatilities of exchange rates. While generalising exchange rates as flexible rates expected to make equal adjustment (in the long run) to country-specific symmetric real shocks, these past studies emphasised currency values rather than behaviours and volatilities as factors of high significance that can make or mar an ensuing currency union.

The underlying belief of this chapter is that exchange rate stability and similarities in patterns of exchange rates/markets behaviours are implied OCA conditions. Countries meeting the OCA conditions to a greater degree exhibit exchange rates that are not prone to currency crisis. This perceives the nominal and real exchange rates as playing positive (or negative) in macroeconomic performances of countries proposing to form a currency union. Therefore, in the context of a monetary union, macroeconomic determinants of exchange rate should be well coordinated if these rates are to be stable. It is therefore important to assess the effects of these different determinants on exchange rates behaviour in the WAMZ in attempts to

establish the similarities in their patterns of movements and directions. These necessitated the analyses of the behaviours of bilateral exchange rates and exchange markets within the WAMZ. In the cases of the WAMZ countries, this chapter assesses: (i) exchange rate determination and the associated macroeconomic fundamentals; and (ii) exchange market pressures and uniformity in how the external pressures were handled as well as further investigation into currency crisis vulnerability of the WAMZ member countries. Consequently, these are the two major sub-sections of this chapter and the research questions to be answered by this chapter area on: (i) if there are similarities in exchange rate behaviours, exchange market pressures and exchange rate determination by the fundamentals across the WAMZ; (ii) the uniformity of macroeconomic determinants of exchange rates in the WAMZ and their associated explanatory powers? (iii) if the pattern of exchange market pressure across the WAMZ justify a common approach in handling currency crisis that may erupt in the event of monetary integration characterised by common currency and common central bank.

6.2 Exchange Rate Determination

There are various theories and models of exchange rate determination applicable to the estimation of the rate of exchange of currencies. These theories and models are very useful tools in explaining the behaviour of exchange rates in any given economy. In this chapter, this study analysed exchange rate behaviours in the WAMZ in the context of monetary theory and models of exchange rates. The monetary theory of exchange rate determination is fundamentals-based approach to the modelling of exchange rates which is generally built on the construct of the purchasing power parity (PPP). Monetary models of exchange rate determination formed out of this approach are also referred to as 'structural models' of exchange rate because of their derivation from a system of equation which depict the market equilibrium relationships between nominal exchange rate and macroeconomic fundamental

variables. These models centres on the assessment of the explanatory powers of these macroeconomic fundamentals in the forecast of the nominal rate of exchange. What is common to all monetary models of exchange rate determination is that they all emphasise the crucial role of relative money supplies in offering explanations about exchange rate. At their initial points is the simple view of exchange rate as the price of one currency in terms of another. This is further to the argument that movements of exchange rates can be explained by the demand for and supply of national stocks of money. Out of the various models offered by monetarists in explaining exchange rate behaviour, this study limited itself to two variants of the exchange rate monetary models of exchange rate determination in the case of the WAMZ countries under evaluation. These are the flexible-price monetary model (FPMM) and the real interest differential monetary model (RIDMM). Exchange rates behaviour in the WAMZ are therefore modelled in accordance with the dictates of the theories behind these two models.

6.2.1 Theory and Models

The analyses and assessments of the international parity conditions are essential precursor to the monetary approach to the modelling of exchange rate determination. These were given good attention in Chapter 3 of this thesis. Although, the PPP is of great relevance, a major defect of the PPP theory is that it does not hold for all types of goods and that it is just about goods arbitrage and says nothing about international capital movements. Nevertheless, despite this, PPP still has a role to play in exchange rate determination; and this is the basis of the motivation for the assessments in this chapter in spite of evidences gathered in Chapter 3 of thesis towards the conclusion that PPP, IFE and UIP do not hold across the WAMZ.

In the asset models of exchange rate determination, the interrelationship between the demand and supply of the specified assets determine exchange rates as the relative price of two currencies. The measurements of these relative prices is in terms of the relative demand for

and supply of money. The assets model approach of exchange rate (with perfect capital mobility as basic assumption) can be broken down into two major categories: (i) monetary models approaches (with perfect capital substitutability as core assumption) and (ii) portfolio balance approaches (with imperfect market substitutability as core assumption). The monetary approach to exchange rate determination (which is direct outgrowth of the PPP theory and the quantitative theory of money) suggests that exchange rate is the relative price of two monies. This monetary model of exchange rate determination reflects real interest rate as exogenous in the long run and as a variable which is determined in the world markets due to the perfect capital mobility implicit assumption. These imply that the monetary approach two exchange rate determination hinges on two basic assumptions: (i) perfect capital mobility; and (ii) perfect market substitutability of domestic and foreign assets. Perfect substitutability of domestic and foreign bonds infers that the rate of return must be equalised across currencies. Therefore, the common assumption shared by the asset market models is perfect capital mobility which entails the absence of significant transaction costs, capital control or international capital flows impediments.

There six aggregate markets in the open market macroeconomics. These are: (i) good markets; (ii) money markets; (iii) labour markets; (iv) foreign exchange markets; (v) domestic bonds (no-money assets) markets; and (vi) foreign bonds markets. The concentration of the monetary model is directly on only one of these markets, which is money markets. The assumption of perfect market substitutability of domestic and foreign assets essentially converts the domestic and foreign bonds markets to a single market. This accordingly brings the number of aggregate markets to five markets out of which three markets are cleared when perfect market flexibility of prices and wages would equilibrate supply and demand in the goods market as well as labour market, while exchange rates freely adjust in order to equilibrate supply and demand in the foreign exchange market. Given these,

the equilibrium of the full system in monetary market is determined by equilibrium conditions for the money market (Walras Law).

The three relationships in a standard monetary model are: (i) money market equilibrium; (ii) purchasing power parity (PPP) and (iii) the uncovered interest rate parity (UIP). The element of an open market is derived from the relationships of the PPP and the UIP. The postulations of the PPP is that an exchange rate is subject to transaction costs such that prices of homogeneous goods in both the domestic and foreign markets are equalised when they are expressed in a common currency. For the UIP, interest rate differential is equated to the expected depreciation of the domestic currency over the term of deposits/bonds to which the interest rates apply. UIP hypothesises that there will be appreciation of currency if domestic interest rate is lower than the foreign interest rate, this implies negative differential while currency appreciation occurs if this differential is positive (that is when domestic interest rates are higher than foreign interest rates). PPP is driven by trade in good and it mainly propels currency transaction in developing economies and accounts for small proportions of developed markets' currency trading. Perfect substitutability of domestic and foreign bonds suggests UIP (as an assets market arbitrage relationship) where domestic interest rate must differ from foreign interest rate by a value exactly equal to the expected rate of currency depreciation.

Generally, developing economies are characterised by 'embryonic' economic terrains and financial markets which are however integrated within international financial markets. In these developing economies, currency demands are hugely driven by trade in goods and services as opposed to developed and emerging economies and financial markets where demands are propelled by large volumes of trade in currencies which can be explained only by currency speculations and hedging activities of market participants. These are micro-structure effects that cause simple monetary models to be unable to fully explain exchange

rate swings in developing economies (Lyons, 2011). Hence, for developing economies (like the WAMZ), in which high price impact of trade may cause the magnitude of exchange rate to be large, there are infrequent currency movements when compared with developed economies. Macroeconomic fundamentals are therefore very likely to play more important role in exchange rate determination in the WAMZ if emphasis is not placed on interest rate parity (IRP) condition. Aron and Ayogu (1997) got evidence to suggest that in developing economies (like those of the WAMZ), IRP is not theoretically realistic assumption and not also an empirical fact. Domestic and foreign assets are never near perfect substitutability while currency and fixed income markets are characterised by high degree of illiquidity. Generally (and specifically for the WAMZ), financial markets are at the rudimentary levels. Theoretical motivations for the arbitrage-based IRP is not applicable in developing economies characterised by nascent or less-developed financial markets. Thus, for the WAMZ, in consideration of the monetary model of exchange rate determination as proposed by Frankel (1976), Mussa (1976) and Frankel and Rose (1995), only money market equilibrium. Consequent upon the foregoing discussions, the monetary models of exchange rate employed in this study do not assume the UIP. Because of the developing nature of the WAMZ economies and the under development of their financial markets, PPP is otherwise considered as the international parity condition. Further evaluation is placed on PPP here in order to explore currency relationships for the monetary zone and assess similarities in the characteristics of exchange rates underlying fundamentals among the WAMZ countries towards the adoption of a future common currency.

The flexible-price monetary model (FPMM) assumes that goods prices are perfectly flexible, implying that the PPP holds instantaneously at all times. This model was first developed by Frenkel (1976), Mussa (1976) and Bilson (1978). According to Bilson, the approach reflects

the quantity theory of money and strict PPP.[98] The FPMM incorporates the effect of inflationary expectation and its major argument is that within an economy, all prices (wages, exchange rates, prices *etc*.) are in both the long run and short run flexible (upwards and downwards). Therefore, the reduced form exchange rate equation for the FPMM could be derived from the major assumptions that: (a) prices, nominal interest rates and nominal exchange rates adjust instantaneously to clear goods, money and foreign exchange markets; (b) there are stability in monetary conditions (meaning that the Quantity Theory of Money holds at all times); (c) money demand function is stable; and (d) PPP holds continuously. These assumptions can be expressed thus:

$$p = m^s - m^d \quad 6.1$$

$$p^* = m^{s^*} - m^{d^*} \quad 62$$

$$m^d = \alpha y - \beta i \quad 6.3$$

$$m^{d^*} = \alpha y^* - \beta i^* \quad 6.4$$

$$p = s + p^* \quad 6.5$$

where p is the price level, m is the money supply, y is the real income and i is the nominal interest rate, s is the exchange rate while superscript d is the demand variable and superscript s is the supply variable while superscript $*$ indicate the corresponding foreign variable. Equation (6.1) represents the proposition of a stable monetary condition while Equation (6.2) stands for the proposition of stability in the foreign monetary condition. Equations (6.1) and (6.2) indicate the implication of instantaneous adjustment in the price levels towards bringing equality between demand for money and supply of money as well as further implication of the essence of QTM where, given the real demand for money, the nominal money supply

[98] In the Quantity Theory of Money, monetary equilibrium between nominal money supply and real money demand determines fully flexible prices.

determines the price levels. Equation (6.3) indicates that the demand for nominal money balance is a stable function of real income and nominal interest rate in the domestic country as well as in the foreign country as shown in Equation (6.4). Parameter α measures income elasticity of demand while parameter β measures the interest rate semi elasticity of demand for money. Equation (6.5) shows the PPP condition in which: (a) there is one-to-one movement in the domestic price level and the exchange rate adjusted foreign price level; and (b) the adjustment of the exchange rate to offset the inflation differential. Under a flexible exchange rate regime, money supply is exogenous; and through equations (6.1) and (6.2), price is determined. Equations (6.3) to (6.5) determine the nominal interest rate and exchange rate. On the other hand, under a fixed exchange rate system, money supply is exogenous, where the domestic price level is determined by Equation (6.5), while Equations (6.1) to (6.4) determines the real money balance in the domestic and foreign countries. What these indicate is that without alterations to the underlying structure of a model of exchange rate, the underlying regime of exchange rate specifies the set of independent variables.

With the assumption that money supply could be exogenously determined by the monetary authorities in the domestic and foreign countries (that is $m^s = m$ and $m^{s^*} = m^*$), if Equations (6.1) to (6.4) are combined, we will have:

$$p - p^* = (m - m^*) - \alpha(y - y^*) + (i - i^*) \qquad 6.6$$

The information in Equation (6.6) is that in consideration of the real domestic and foreign demand for money, price level in the domestic country will be lower (higher) than the price level in the foreign country by the extent to which the money supply in the domestic country is lower (higher) than money supply in the foreign country. If Equation (6.5) is substituted into Equation (6.8), we will obtain:

$$s = (m - m^*) - \alpha(y - y^*) + (i - i^*) \qquad 6.7$$

This is the Flexible-price monetary model of exchange rate determination which leads to an exchange rate equation depicting the nominal exchange rate as the relative price of two national monies (dependent variable) being determined by the independent variables which are the relative money supply, relative income and relative interest rate differential. This is a model which introduces the role of money supplies, inflationary expectations and economic growth as exchange rate changes determinants but based upon the premise that all prices within an economy are fully flexible. The model simply posits that what matter for exchange rate determination is money demand in relation to money supply and that this causes countries with high monetary growth to develop high inflationary expectations leading to reduction in demand to hold real money balances, increased expenditure on goods, increase in domestic price level and depreciation in currency so as to maintain the PPP (Pilbeam, 2010).

The assumption taken by Dornbusch (1976) is that prices are not perfectly flexible continuously. His argument is that in the short run, prices are very likely to be sticky thereby causing nominal interest rate changes to reflect in the contractionary monetary policy. Further assumption is that the PPP does not hold in the short run, but in the long run.[99] This means that the PPP condition is temporarily violated when the short run price stickiness sets in, and consequently, the exchange rate has to reflect the monetary policy's short term liquidity effect. Recalling the Fisher effect as indicating that the nominal interest rate is made up of real interest rate and expected inflation, if the differential of the spot exchange rate and the long run equilibrium rate as well as the differential of expected long run inflation between the domestic and foreign countries positively explain expected depreciation of the exchange rate, the following relationship evolves:

[99] This follows Dornbusch (1976) and Frankel (1979).

$$E(s) = -\lambda + (s_t - \bar{s}_t) + \pi_t^e - \pi_t^{e^*} \quad 6.8$$

where is λ the speed of adjustment to equilibrium while the bar over the variable denotes long run equilibrium. If the Fisher equation ($i = r_t + \pi^e$) and its foreign version are combined, they yield:

$$s_t - \bar{s}_t = \frac{1}{\lambda}\{(i_t - \pi_t^e) - (i_t^* - \pi_t^{e^*})\} \quad 6.9$$

The simple explanation of Equation 6.9 is that the gap between spot rate and its long run equilibrium level is proportionate to the real interest rate differentials between two countries. As already stated, a stiff monetary policy is therefore required so as to raise interest rate differentials. The short run interest rate captures the liquidity effect. If PPP holds in the long run, this is represented as:

$$\bar{s}_t = \bar{p}_t - \bar{p}_t^* \quad 6.10$$

It is further assumed that the differentials of interest rate and expected inflation must be equal thus:

$$\bar{r}_t - \bar{r}_t^* = \pi_t^e - \pi_t^{e^*} \quad 6.11$$

We can consequently re-state equation (6.11) as:

$$\bar{s}_t - \bar{s}_t = \frac{1}{\lambda}\{(\bar{\imath}_t - i_t) - (\bar{\imath}_t^* - i_t^*)\} \quad 6.12$$

The implication of equation (6.12) is that whenever nominal interest rate increases over and above its equilibrium level, exchange rates overshoots its long run rate. If equations (6.7), (6.11) and (6.12) are combined, they produce:

$$s_t = (m_t^* - m_t) - \beta_y(y_t^* - y_t) + \beta_\pi(\pi_t^{e^*} - \pi_t^e) \quad 6.13$$

By substituting equation (6.13) into (6.12) we obtain the sticky price monetary model (SPMM) thus:

$$s_t = (m_t - m_t^*) - (y - y^*) - (i_t - i^*) + (\pi_t^e - \pi_t^{e^*}) \quad 6.14$$

The major innovation of the SPMM is that it emphasises capital-market arbitrage as major short-run determinant of exchange rates (rather than goods-market arbitrage which is viewed as medium to long run determinant). The model offers good explanations on why movements in international prices and changes in international money stocks account for exchange rate changes while clarifying that such movements are due to rationale foreign exchange market that yields exchange rates which exhibit deviations from PPP based on the realities of economic fundamentals and not in isolation from these fundamentals. This model also assists in explaining the reason why exchange rates experience volatility more than supposed determinants like money supply.

Frankel (1979) developed the real interest differential monetary model (RIDMM) which accommodates here (FPMM and SPMM), with the introduction of interest rate differentials as additional explanatory variable that allows for the role of differences in secular inflation rates. The argument here is that changes in long term nominal interest rates serves as measure of changes in inflation expectations. His view is that it is only short term interest rate differential that moves independently of inflation. Long term interest rate differential is introduced into exchange rate models either because long term interest rate serves as the measure of the cost of holding money or rather because long term interest rate proxies for interest rate differential. From any of the two points of views, whenever domestic long term interest rate differential rises, there would be reduction in real money demand and consequently, higher prices and depreciation of currency. Drawing from the SPMM, the RIDMM assumes that the PPP is valid in the long run even if it fails to hold in the short run.

The mechanism of the postulation of the RIDMM points to the determination of the expected change in the exchange rate as: (a) the gap between the current spot rate and the long run equilibrium rate; and (b) the expected long run inflation differential. These could therefore be expressed in two-fold. Firstly as:

$$E(\Delta s) = i - i^* \qquad 6.15$$

which indicate that in the absence of uncertainty, but in situation of perfect capital mobility and neutrality of market participants, expected rate of domestic currency depreciation equals interest rate differential. Secondly as:

$$E(\Delta s) = \theta(\bar{s} - s) + (\Delta p^e - \Delta p^{*^e}). \qquad 6.16$$

which states that exchange rate is expected to return to its long run equilibrium value $\bar{s}$ at a proportional rate of the current gap. The long run implication of $\bar{s} = s$ is that the expected change to exchange rate is at a rate equal to the long run inflation differential $\left(\Delta p^e - \Delta p^{*^e}\right)$, and this equals the expected long run relative monetary growth rate. If equation (6.15) and (6.16) are combined in solving for s, we obtain:

$$\bar{s} = s\frac{1}{\theta}[(i - \Delta p^e) - (i^* - \Delta p^{*^e})] \qquad 6.17$$

Equation 6.17 specifies that when prices of goods are sticky in the short run, exchange rate overshoots its long run value only to converge on this long value when prices of goods adjust in the long run. What this equation is saying is that as tight monetary policy would lead to the rise in nominal interest differential above its long run level, capital inflow prompt rise in domestic currency above its equilibrium value in proportion to the expected real interest rate differential.

RIDMM as a general model combining the traits of the FPMM and SPMM, can be derived from Equation (6.17) through the identification of the long run equilibrium exchange rate determinants (the equilibrium relative price ($\bar{p} = \bar{p}^*$) which have the domestic and foreign equilibrium monetary conditions as the principal determinant). With the assumption of money market equilibrium (where $\bar{\imath} = \bar{\imath}^* = \Delta p^e - \Delta p^{*^e}$ indicating that nominal interest rate differential is equal to inflation differential), we can express the expected equilibrium relative prices as a function of the relative money supply, relative income and the long run expected inflation differential, yielding:

$$(\bar{p} - \bar{p}^*) = (\bar{m} - \bar{m}^*) - (\bar{y} - \bar{y}^*) + \beta(\Delta p - \Delta p^*) \qquad 6.18$$

with the assumption that the equilibrium relative money supply and income are given by the current actual levels, if equation (6.17) is substituted into equation (6.18), we will have an equation representing the RIDMM thus:

$$s = (m - m^*) - \alpha(y - y^*) + \frac{1}{\theta}(i - i^*) + \left(\frac{1}{\theta} + \beta\right) - (\Delta p^e - \Delta p^{*^e}) \qquad 6.19$$

If some right hand terms of equation (6.19) are rearranged, it can lead to a specification that reveals the RIDMM having a resemblance of FPMM, only for the inclusion of the real interest rate differential on the right hand side of the FPMM thus:

$$s = (m - m^*) - \alpha(y - y^*) + \beta\left(\Delta p^e - \Delta p^{*^e}\right)\frac{1}{\theta}\left[(i - \Delta p^e) - \left(i^* - \Delta p^{*^e}\right)\right]. \qquad 6.20$$

If Equation 6.19 is rewritten, we obtain the reduced form of RIDMM as:

$$s = (m - m^*) - \alpha(y - y^*) + \gamma(i - i^*) + \delta\left(\Delta p^e - \Delta p^{*^e}\right). \qquad 6.21$$

This equation shows that the RIDMM includes both the FPMM and SPMM. The clarifications made by the Frankel's RIDMM is that if the set of real interest rate is at a disequilibrium, exchange rate will then deviate from its long run-run equilibrium value; and if

the real domestic interest rate falls below the real foreign interest rate, the exchange rate of the domestic currency will then be undervalued in relation to its long run equilibrium value in order to cause compensation in the form of an expected appreciation of the real exchange rate of the domestic currency.

Nevertheless, the unrealistic assumption that financial assets (domestic and foreign) are perfect substitutes is a major shortcoming of the monetary models of exchange rate determination. As well, the theoretical literature give recognition to the influence of hedging, speculation and international trade and payments. Nevertheless, because of the peculiar nature and environment (economic, political and legal) of the developing countries, some distinct factors should be recognised in the modelling of exchange rate determination and behaviour in this class of countries. It is important to stress here again that the WAMZ economies under investigation operate sizeable proportion of informal economic activities which impact exchange rate behaviour. Therefore, it is appropriate to consider the effects of the informal economy in the modelling of exchange determination and behaviour in these countries. When the augmentations of informal economic activities and primary commodity price were introduced into the two monetary models of exchange rate determination for the WAMZ countries, the flexible price monetary model turned out as:

$$s_t = md_t - yd_t + id_t + yd_t + CP_t^n \qquad 6.22$$

while the real interest differential monetary model resulted in:

$$s_t = md_t - yd_t + id_t + \pi d_t^e + syd_t + CP_t^n \qquad 6.23$$

Where $md_t, yd_t, id_t, syd_t, CP_t^n$ and π_{dt}^e are of money stock differentials, real income differential, interest rate differentials, informal (shadow) economy's real income differential, commodity price and long run inflation differential respectively. What the flexible price monetary model of exchange rate determination in Equation 6.22 predicts here is that

exchange rates are affected by relative money supplies, relative levels of national income (formal and informal) and relative interest rate while these were controlled for by price of primary commodities. This is a novel step taken in exchange rate behaviour empirical literature. The augmentation of the theoretical structural models with the effects of informal economic activities and commodity prices as supplementary factors in explaining the dynamics of nominal exchange rates contributes to the resolution of extant empirical exchange rate disconnect puzzles in these developing nations.

Failure of Monetary Models: Series of research methodologies involving econometric and statistical techniques have been applied to investigate currency parities in many researches on monetary models of exchange rate determination. Generally, in these past studies, these monetary models performed poorly as a very large number of empirical findings failed yield evidences in support of relationships between macroeconomic fundamentals and exchange rates under the floating exchange rate regimes. Most of these empirical works rejected the absolute PPP assumption which is the monetary models' bedrock.[100] Consequently, it can be suffice to state that the failure of these monetary models could be strongly ascribed to deviations of PPP as Smith and Wickens (1994) established that the rejection of the monetary models often emanated from the breakdown of the PPP assumptions. In spite of the devotion of attention of academic empirical researches to PPP deviations, Afat et al (2015) in a study of flexible exchange rate determination in OECD countries asserted that the failure of monetary models is due to the insufficiency of the Keynesian Money Demand Function which disregards intercountry money demand, particularly for currency parities comprising 'reserve currencies' (US dollar, euro, pound sterling, Japanese yen) commonly traded with

[100] Husted and MacDonald (1998), Groen (2000), Rapach and Wohar (2004), Sosvilla-Rivero and Garcia (2006), Uz and Kentenci (2008) Cerra and Saxena (2010).

internationally and which are only demanded for and kept in reserve by many monetary authorities, being reserve currencies for the purpose of maintaining financial stability and for intervention in the foreign exchange market as and when necessary. These global demand for these reserve currencies (particularly the euro and US dollar) for international trade and direct investment and for assets and currency swaps are huge but the implied assumption of the monetary model of exchange rate is that currency are not demanded as reserve currencies internationally. This narrow perception overlooks the various reasons for foreign currencies demand. This is a major drawback of these monetary models. Further highlights by Afat et al (2015) was that currency substitution (relating to demand for reserve currencies which are parallel (or as alternatives) to domestic currencies) is a crucial in negatively impacting the mechanism of these monetary models. An instance is a situation in which foreign currency is a reserve currency while the domestic currency is not and in this case, there should appropriately be appreciation of nominal exchange rate whenever there is increase in the home country's real income, however in real sense, because it is impossible to separate the demand for domestic currency from the demand for foreign (reserve) currency, there may not be appreciation of domestic currency as expected. Another shortcoming of the monetary models identified is the restriction imposed on econometric model (which requires one-to-one relationship between money supply and price levels) by the decomposition of real money balances and the use of money supply and price level individually as entrenched in the underlying PPP theory. Also, while these monetary models assume stable income elasticity and interest rate semi-elasticity, it is very possible that these may not be achievable due to financial crises, developments in the financial systems and changes in banking sector regulations (like the use of bank cards taking prominence over the use of physical cash). These are some of the fundamental flaws of monetary models of exchange rate determination.

6.2.2 Data and Methods

Data (annual and quarterly) generally spanning between 1980 and 2015 on US dollar/WAMZ countries' bilateral exchange rates and fundamental data of money supply, nominal interest rates, inflation, real GDP, estimated real GDP of the informal economy, and primary commodity price were employed for the six WAMZ countries for the purpose of exchange rate determination in the WAMZ. Appropriate cross-rate conversions were made to generate bilateral exchange rates among the WAMZ countries.

The monetary model constructed here considered the extent of informal economy in member countries. As earlier indicated in Chapter 3, estimates of the sizes of informal economy incorporated into the monetary models here were generated with the application of the Multiple Indicators Multiple Causes (MIMIC) modelling.[101] These secondary data (percentages) of shadow economies as generated by Medina and Schneider (2018) were employed for the estimation of the real GDP of the informal economy as percentages of the formal real GDP. Informal real GDP estimated over the period between 2001 and 2015 were in line with the related percentages exhibited in Table 3.1.

Apart from incorporating informal economic activities in the modelling of exchange rate determination here, the monetary models were further augmented with the effects of primary commodity price, given the fact that the WAMZ countries under assessment are primary commodity producing countries. Although, market powers of a country in the world commodity market is a source of endogeneity and there is the possibility that WAMZ commodity exporting countries hold market powers in the world commodity market. It may therefore be inappropriate to augment these monetary models with country-specific commodity price indices due to the potential problem of endogeneity that could bias the

[101] MIMIC is a special type of structural equation model (SEM) which is frequently used in literature.

estimates. Nevertheless, country-specific weighted commodity price indices in relation to the generalised 'world commodity price indices' estimated for each WAMZ country were applied in these respects in order to avoid (or reduce) potential endogeneity. For individual WAMZ countries, this study applied the specific class of indices into which the top export commodities of each country fall. The percentage of these top primary export commodities in the total exports were applied as weights to these class-index to generate country indices applied in this work.

For estimations based on annual data, the macroeconomic fundamentals in the models were expressed in the annual percentage change difference between those of the five WAMZ countries (The Gambia, Ghana, Guinea, Liberia and Sierra Leone) and that of Nigeria (a possible lead economy). This approach was applied in order to generate more stable results when seasonal effects in the data are removed and when noise are removed from the short term movements in the exchange rate and the explanatory fundamentals. The estimations of the two exchange rate determination models built here were performed in two-fold. In the first instance, the model estimations were carried out from the perspective of the US dollar bilateral exchange rates of the six countries. In the second instance, the Nigerian naira bilateral exchange rate of the five other WAMZ countries were estimated. The reason for the second instance estimation is the big size of the exchange market of Nigeria which may absorb other exchange markets in the event of the monetary union coming into fruition due to the fact that these five other economies sharing less than 20% of the total GDP of the entire proposed monetary zone will be in a monetary integration in which Nigeria is big enough to dominate with her strong economic forces that can cause the country to solely determine the proposed single official exchange rate for the proposed union. Apart from checking the similarities (or otherwise) in the expected signs of coefficients of the fundamentals, the

inclusion of commodity price index further reveals the similarities (or otherwise) in the role of commodity price in determining exchange rate movements in the WAMZ.

In the annual data evaluation, the two monetary models of exchange rate determination were estimated with the application of the Canonical Cointegrating Regression (CCR), Dynamic Ordinary Least Square (DOLS) regression and Markov Switching Dynamic (MSD) regression approaches for country estimation and Random Effect (Generalised Least Square) estimation of panel data of the six WAMZ countries in order to answer the pertinent question relating to the homogeneity of exchange rate behaviour in the six WAMZ countries was further performed. The questions to answer by the application of this approach on exchange rates of these countries are about: (i) the linearity of exchange rate behaviour; (ii) the major dynamics characterising exchange rate behaviour; (iii) the key fundamentals that determine regime switches and the uniformity in the forces driving regime switches as a well as the roles played by the fundamentals in this regard. The CCR and DOLS methods were applied to establish if the signs of the fundamentals are comparatively, in line with the theoretical expected signs and to determine homogeneities across the proposed member countries of the WAMZ in this respect. The application of the MSDR was meant to assess the pattern of the time-varying influence of macroeconomic fundamentals on exchange rate movements in these countries. The motivation for the application of a more sophisticated estimation of the models of exchange rate fundamental determination through the MSDR was prompted by the poor explanatory powers of the structural monetary models of exchange rate determination in the ordinary sense.

Exchange rates are one of the many economic and financial time series that undergo periods in which the series behaviour changes quite dramatically when compared to what was exhibited during the previous period. The time series behaviour could be of change over time in terms of volatility, its value or rather the extent to which its current value is related to its

past value. The time series may have 'structural break' when its behaviour may change once and for all. In some regards, the series may change for a time period before reverting back to its original behaviour or rather experience 'regime switch' in which case the series switch to another style of behaviour due to wars, financial panics, government policy changes etc. A possible approach towards solving this apparent problem of time series shifts is to split data around the time of change and estimate separate model for each segment. Such model should be flexible enough to allow different types of behaviour at different point in time. Markov switching regression method belongs to the category of regime switching methods that allow this. Markov switching dynamic (MSD) regression is a useful tool to apply in describing exchange rate behaviour due to regime changes in the real world of economies and finances. It defines two or more states/regimes. Therefore, the approach vividly reveals the dynamic process and behaviour of variables of interest and give researcher a clear idea of how the variable evolved in the past as well as the possible future dynamics. The econometric equations of the FPMM and RIDMM models in Equations 6.22 and 6.23 above are expressed below for estimation with CRR, DOLS and MSD regressions:

$$\Delta s_t = \alpha + \beta_m \Delta md_t - \beta_y \Delta yd_t + \beta_i \Delta id_t - \beta_{sy} \Delta syd_t + \beta_{cp} \Delta CP_t^n + \varepsilon_t \qquad 6.24$$

and

$$\Delta s_t = \alpha + \beta_m \Delta md_t - \beta_y \Delta yd_t + \beta_i \Delta id_t + \beta_{p_t^e} \Delta \pi d_t^e - \beta_{sy} \Delta syd_t + \beta_{cp} \Delta CP_t^n + \varepsilon_t \qquad 6.25$$

where Δ indicates one-year percentage change in the respective independent variables and exchange rate. In the MSD regression, the coefficients α and β depends of state variables which may be (1) or (2). Exchange rates and fundamentals in these models are expressed in one-year percentage changes because PPP which is a crucial element of the monetary models holds for differences, rather than holding at levels. For the MSD regressions, this approach yields the possibility of reducing noise in the observations as well as taking care of seasonal effects of the data involved. All coefficients are allowed to switch in between states. These

coefficients are dependent on the regime variables. The transition probabilities are of greater interest. The method allows the probabilities transition matrix to vary/change so as to conform to the Markov switching monetary models of exchange rate and the time varying transition probabilities models. Further to the application of annual data to the assessments of the FPMM and the RIDMM, higher frequency quarterly data were equally applied. These data span over the period between 1995Q1 and 2015Q4. These evaluation were necessary to provide further insights into the investigations of the performance of these monetary models, drawing from the fact that long run relationships are better captured in analyses with high frequency data.

For the econometric estimation of FPMM, relative money supply is expected to be positive and unity, domestic output is hypothesised to be negative while nominal interest rate is expected to be positive. Increase in domestic money stock relative to foreign money supply leads to a rise in exchange rate, implying a fall in domestic currency's value. On the other hand, when domestic output increases, there is domestic currency appreciation. Domestic currency depreciates when there is a rise in interest rate because such increase causes reduction in domestic money demand. When relative domestic real income rises, this prompts excess demand for domestic money, all other things being equal. When economic agents attempt to increase their real money balance, this would cause domestic residents to reduce expenditure, and consequently, price would fall until money market equilibrium is achieved. The fall in domestic prices (when foreign prices are constant) amounts to domestic currency appreciation, according to the PPP theory. On the RIDMM, the argument of Frankel (1979) was that the change in nominal interest rate is a reflection of changes in monetary policy tightness and that the reason for increase in domestic interest rate (relative to foreign interest rate) is the contractions in domestic money supply relative to domestic money demand without a fall in price to match this. Domestic interest rates higher than foreign interest rates

attract capital inflows, leading to instant appreciation of domestic currency. Consequently, in RIDMM, there is negative relationship between exchange rates and nominal interest rate differentials. Drawing from an assumptions of FPMM, nominal interest rates are reflections of expected inflation changes. There is a rise in domestic nominal interest rate because of the expectation that domestic price would, through inflation and depreciation, lose its value. Demand for domestic currency (relative to the demand for foreign currency would fall causing the domestic currency to depreciate (increase the exchange rate).

6.2.3 Findings and Results

The implications of the outcomes the ADF and PP unit roots tests for the variables employed in the estimation of the monetary models of exchange rate determination for the WAMZ countries are expressed in Table 6.1 below.

Table 6.1: Results Unit Roots Tests for the Variables of Exchange Rate Determination

Variables	*Gambia*	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*S/Leone*
Nominal Exchange Rate (US	I(1)	I(1)	I(1)	I(1)	I(1)	I(1)
Dollar)	I(1)	I(1)	I(1)	I(1)	na	I(1)
Nominal Exchange Rate(NGR	I(1)	I(1)	I(1)	I(1)	I(2)	I(2)
Naira)	I(1)	I(1)	I(1)	I(2)	na	I(1)
Relative Money Supply (US)	I(0)	I(1)	I(1)	I(0)	I(0)	I(0)
Relative Money Supply (NGR)	I(0)	I(0)	I(0)	I(0)	na)	I(0)
Relative Real Interest Rate (US)	I(0)	I(1)	I(1)	I(1)	I(1)	I(1)
Relative Real Interest (NGR)	I(1)	I(1)	I(1)	I(1)	na	I(1)
Relative Nominal Interest (US)	I(1)	I(2)	I(2)	I(1)	I(1)	I(1)
Relative Nominal Interest (NGR)	I(2)	I(1)	I(1)	I(2)	na	I(1)
Relative Real Income (US)	I(0)	I(0)	I(2)	I(1)	I(0)	I(1)
Relative Real Income (NGR)	I(0)	I(0)	I(1)	I(0)	na	I(0)
Relative Expected Inflation (US)						
Relative Expected Inflation (NGR)						
Oil Commodity Price: I(1)						
Non-fuel Commodity Price: I(1)						

Source: Author's estimations. Note: ADF and PP unit root tests were carried out at 5% level of significance
'US' indicates variables for the US dollar based models while 'NGR' variables are for the Nigerian naira-based models.

The variables of exchange rate determination for both the US dollar rate and the Nigerian naira rates reported a mix of stationarity, first-order integration and second order integration. All non-stationary variables were made stationary according to the respective orders of integration.

The first task was to examine if the fundamentals yield the expected theoretically hypothesised signs in the two monetary modelling (FPMM and RIDMM), in the two instances of modelling and estimation (US dollar rate and the Nigerian naira rates). Homogeneity in these expected signs among the WAMZ countries were also evaluated, given the necessity for the underlying properties and fundamentals of exchange rate determination in these countries to behave in similar manner if the adoption of the future single exchange would be appropriate for all. Table 6.2 below exhibits these expected signs and explanatory powers of the fundamental's coefficients of the exchange rates applied.

Table 6.2: Expected Signs of Coefficients of Fundamentals in Monetary Models of Exchange Rate Determination

Fundamentals/Models	Flexible Price Model	Real Interest Diff. Model
Relative Money Stock	+	+ (>0)
Relative Real Income	-	-(<0)
Relative Nominal Interest Rate	+	-(<0)
Commodity Price Shock	+	+
Relative Real Interest Rate	not applicable	+(>0)

Source: Theoretical Literature

The results of the CCR and DOLS estimations performed are shown in Table 6.3 below for the US dollar and the Nigerian naira rates. We can remarkably observe that relative money stock coefficients generate the expected positive signs for all the six countries in the CCR and DOLS regressions of the FPMM and the DOLS estimations of the RIDMM. It is interesting to note that all the fundamentals for The Gambia (reported as the most economically stable of all) and Nigeria (the largest economy) generated the expected coefficient in the FPM model in both CCR and DOLS estimations. For the RIDMM, all the fundamentals of The Gambia and Nigeria produced the expected coefficient signs. It is apparent that at least two-third of the WAMZ countries had two of their fundamentals money supply and nominal interest rates (which are two strong monetary policy instruments) yielding the same coefficient signs in the two monetary models of exchange rate determination when the two estimation methods were employed.

Table 6.3: Cointegrating Equation Estimation Coefficients and Signs of the Fundamentals in the US Dollar/WAMZ Exchange Rates Determination Modelling

Flexible Price Monetary Model: Canonical Cointegrating Regression (CCR)						
Variables	**Gambia**	**Ghana**	**Guinea**	**Liberia**	**Nigeria**	**S/Leone**
Relative Money Stock	+0.570*	+0.961*	+1.780*	+2.374*	+0.803*	+1.116*
Relative Real Income	-1.29**	-1.265**	-1.795***	+0.680	-2.029	-0.816
Relative Nominal Interest Rate	+0.056*	+0.010	+0.005	-0.103*	+0.051*	+0.014*
Commodity Price Shock	+0.001	-0.006	-0.015	-0.087	+0.003	-0.012
Flexible Price Monetary Model: Dynamic Ordinary Least Square (DOLS)						
Variables	**Gambia**	**Ghana**	**Guinea**	**Liberia**	**Nigeria**	**S/Leone**
Relative Money Stock	+0.444*	+0.895*	+1.486*	+2.131*	+0.803*	+1.116*
Relative Real Income	-0.609	+1.161	-16.373	+0.265	-3.636*	-0.0871
Relative Nominal Interest Rate	+0.074*	+0.005	-0.045	-0.051	+0.055*	+0.006
Commodity Price Shock	+0.001	-0.026	+0.000	-0.087	+0.003	-0.012
Real Interest Rate Differential Monetary Model: Canonical Cointegrating Regression (CCR)						
Variables	**Gambia**	**Ghana**	**Guinea**	**Liberia**	**Nigeria**	**S/Leone**
Relative Money Stock	+0.621*	+0.948*	+0.980*	+2.434*	+0.979*	+1.118*
Relative Real Income	-1.391**	-1.435*	-0.206	+0.759*	-1.845***	-1.018*
Relative Nominal Interest Rate	+0.052*	+0.011***	-0.001	-0.098*	+0.056*	+0.011*
Relative Real Interest Rate	-0.004	+0.003	-0.007**	-0.007	-0.002	-0.007*
Commodity Price Shock	+0.001	-0.004	-0.013*	-0.092*	+0.001	-0.009*
Real Interest Differential Monetary Model: Dynamic Ordinary Least Square (DOLS)						
Variables	**Gambia**	**Ghana**	**Guinea**	**Liberia**	**Nigeria**	**S/Leone**
Relative Money Stock	+0.520*	+0.911*	na	+4.298	+0.898*	+1.300*
Relative Real Income	-0.703	+0.438	na	+4.103	-3.529*	-0.459
Relative Nominal Interest Rate	+0.068	+0.002	na	-0.087	+0.039*	+0.002
Relative Real Interest Rate	-0.004	+0.005	na	-0.063	-0.011	-0.018**
Commodity Price Shock	+0.000	-0.018**	na	-0.219	+0.015***	-0.018

Source: Author's Estimation and EViews7 Output

The coefficient of commodity price consistently produced its expected positive signs in The Gambia and Nigeria, all through. The percentage achievements of the expected coefficient signs (country by country) within the application of the monetary models and the two estimation methods are as shown in Table 6.4 below.

Table 6.4: Percentage Achievements of the Generation of Expected Fundamentals Coefficient Signs of the US Dollar/WAMZ Exchange Rates Modelling

	FPM Model		*RIDM Model*		*Overall*
	CCR (%)	*DOLS (%)*	*CCR (%)*	*DOLS (%)*	
Gambia	*100*	*100*	*100*	*100*	*100%*
Ghana	*75*	*50*	*60*	*40*	*56%*
Guinea	*75*	*75*	*60*	*na*	*70%*
Liberia	*25*	*25*	*40*	*40*	*33%*
Nigeria	*100*	*100*	*100*	*100*	*100%*
Sierra Leone	*75*	*75*	*80*	*80*	*78%*

Source: Author's Estimation and EViews Output

Liberia scored the least in both models at 25% and 40% respectively for FPM and RIDM models. Ghana also had the least of 40% in the DOLS estimation of the RIDM model. The Gambia and Nigeria both had the overall 100% achievements, followed by Sierra Leone (78%) and Guinea (70%). On the overall, Liberia score the least of 33% achievements; and this indicates that Liberia's exchange rate determination fundamentals were least fit to consider in the determination of an eventual single exchange rate for the future monetary union, whereas, the models for The Gambia, Nigeria and Sierra Leone were able to show 'good fit' in the estimations.

Table 6.5: Panel Data Estimation Coefficients and Signs of Fundamentals of the Nigerian Naira/WAMZ Exchange Rates

Flexible Price Monetary Model		
Fundamentals	***Fixed Effect***	***Random Effect (GLS)***
Relative Money Stock	-0.814*	+0.580*
Relative Real Income	+0.353*	-1.173*
Relative Interest Rate	-0.009	+0.0100
Commodity Price Shock	+0.005*	+0.000
Corr(μ_i, xb):	-0.723	
F/χ2:	0.00	0.00
Rho:	0.98	0.33
Real Interest Rate Differential Model		
Fundamentals	Fixed Effect	Random Effect (GLS)
Relative Money Stock	+0.832*	+0.566*
Relative Real Income	+0.449*	-1.175*
Relative Nominal Interest Rate	-0.007	+0.006
Relative Real Interest Rate	+0.004**	-0.010***
Commodity Price Shock	+0.003	+0.004
Corr(μ_i, xb):	-0.783	
F/χ2:	0.00	0.00
Rho:	0.58	0.35

Source: Author's Estimation and Stata 14 Output

The results of the unbalanced panel data Fixed Effects (FE) and Random Effects -Generalised Least Square (RE-GLS) estimations of the two augmented models of exchange rate determination for the WAMZ in the context of the Nigerian naira exchange rates of the other five member countries are presented in Table 6.6 above. The results of the RE-GLS estimations of the two monetary models were considered due to the negative correlation of explanatory variable and the unobserved heterogeneity across clusters at $Corr(\mu_i\ xb) =$

-0.783, which caused the rejection of the FE estimations results. The panel data fundamentals employed for the two monetary models generated the theoretically hypothesised signs in the RE (GLS) estimations at joint statistical significance. What these imply for the future currency union is that the fundamental determinants of exchange rates within the zone work well in consonance with theoretical postulations (and as desired) towards exchange rate integration when the largest economy within the zone (Nigeria) was factored into the exchange rate determination.

A common reflection of the explanatory powers of the coefficients of the estimated exchange rate fundamentals as reported in Table 6.5 above was the low explanatory powers of the relative nominal interest rate, relative real interest rates and the commodity price shocks (which are much more insignificant) in explaining exchange rates movements in the six countries. These have huge implications for these fundamentals in powerfully influencing the proposed single exchange rate. The generated coefficients of relative money supply in all the WAMZ countries which yielded the theoretical postulated signs, are all statistically significant at 1% level of significance, though for The Gambia and Nigeria, they were less than one when they should theoretical be more than one. Surprisingly, relative real income coefficients (expected to be less than one), were greater than one intermittently for the six countries in FPMM and RIDMM estimations as well as the random effect panel data estimations. Although, monetary models of exchange rate determination were attractive, they worked within some assumptions, some of which are the free adjustment towards the equilibrium exchange rate and supply and demand in the foreign exchange market, perfect substitutability of domestic foreign assets etc. Given these and due to the difficulties in the application of the monetary models uniformly to all countries as evident by deviations of the coefficient signs generated from the theory-backed expectations, owing to different economic

situations and dissimilarities in behaviours, Markov switching regime process of changes in exchange rates serves as alternatives.

Markov Switching Dynamic (MSD) Regression methods were applied to the two monetary models of exchange rate determination to estimate the regime switching behaviours of the US dollar and the Nigerian naira exchange rates of the WAMZ countries, in which all the fundamentals were allowed to switch. The comparative results of the MSD regressions of the FPMM and RIDMM of the US dollar exchange rates are exhibited in Tables 6.6 and 6.7 below respectively. For the PFMM, the levels of persistence range from 0.64 to 0.97. The Gambia and Nigeria each record the highest probability of 0.97 of remaining in the first state, translating into expected duration of 38.5 years and 31.59 years respectively, while Liberia and Guinea has the lowest of 0.88 years and 0.81 years respectively. In regime two, Nigeria has the lowest probability of 0.64 and the lowest expected duration of 2.8 years.

The Gambia's highest transition probability under this regime translates into 16.57 years of expected duration. Relatively, The Gambia had the most stable expected duration time of all the six WAMZ countries, followed by Nigeria and Ghana. Guinea reported to be the least volatile in the entire process. In spite of these implications, the best fitted FPM model was that of Liberia with the lowest AIC, HQIC and SBIC values, while the log likelihood results infer Guinea (with the highest log likelihood value) as having the maximum likelihood maximisation procedure that gives the best result at -20.161. For the MSD regression of the RIDMM of the US dollar exchange rates, The Gambia, Ghana, Sierra Leone had the highest probability of remaining in the first regime and high expected duration of 39.42, 29.04 and 39.70 years respectively. In the second regime. The Gambia and Sierra Leone keep the highest levels of persistence, both of 0.94 transition probabilities and highest expectation durations of 18.14 and 17.35 years respectively.

Table 6.6: Comparative Statistics and Fundamental Coefficients of Markov Switching Dynamic Regressions (US Dollar/WAMZ Currencies)

Annual Flexible Price Monetary Model						
Fundamentals	***Gambia***	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
∆*Relative Money Supply:*						
State 1:	-1.855	0.552*	0.637*	0.019	0.033	0.535
State 2:	6.178*	2.77*	0.067***	0.690*	2.266**	17.662*
∆*Relative Real Income:*						
State1	-3.786	21.921	10.728*	-0.035	7.080	-3.049
State 2	-29.057*	262.596*	-12.489	2.124*	186.57*	115.033*
∆*Relative Nominal Interest:*						
State1:	0.018***	-0.068	-0.046*	-0.05*	0.026	0.329
State 2:	0.193	0.555*	-0.016*	0.016*	0.793*	-0.210*
∆*Commodity Price Shock:*						
State1:	-0.144*	-1.173*	-0.100*	-0.009	0.136	-0.117
State 2:	0.582***	0.851	-0.004	0.030*	9.861*	4.604*
Transition Probability:						
P11:	0.97	0.96	0.81	0.88	0.97	0.93
P22:	0.94	0.75	0.86	0.78	0.64	0.71
Expected Duration:						
State 1:	38.50	27.05	5.40	0.31	31.59	15.28
State 2:	16.57	3.96	7.11	8.34	2.80	3.41
Standard Deviation (Sigma):	2.176	15.46	0.43	4.54	1.97	8.94
AIC:	5.454	9.485	3.159	2.044	8.942	8.554
HQIC:	5.653	9.682	3.299	2.243	9.141	8.753
SBIC:	6.038	10.080	3.805	2.628	9.526	9.140
Log Likelihood	-79.721	-138.755	-20.161	-21.744	-139.013	-132.424
No. of Observations:	34	32	21	34	34	34

Source: Author's Estimation and Stata 14 Output

In the current regime, the lowest probability of 0.87 was recorded by Liberia as Guinea had the lowest of 0.0 in the second regime. Nigeria and Liberia recorded second regime's lowest expected duration of 1.89 and 1 years respectively. Liberia has the least process volatility of 0.35 in the RIDMM estimations, the best fitted model with the lowest AIC, HQIC and SBIC values and the model yielding the best result in the maximum likelihood estimation procedure. The Nigeria naira/WAMZ currencies exchange rates were equally applied to the two monetary models of exchange rate determination (FPMM and RIDMM) in the MSD regressions.

Table 6.7: Comparative Statistics and Fundamental Coefficients of Markov Switching Dynamic Regressions (US Dollar/WAMZ Currencies)

Annual Data Real Interest Rate Differential Monetary Model						
Fundamentals	***Gambia***	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
∆*Relative Money Supply:*						
State 1:	-1.914*	0.545*	-0.009	-0.103*	0.016	0.005
State 2:	6.276*	2.760*	-0.158*	0.242**	1.404*	14.612
∆*Relative Real Income:*						
State1	-4.049	20.264	1.928*	0.108***	16.720***	-2.426
State 2	-80.450*	269.889	109.98*	1.930*	556.89*	180.952*
∆*Relative Nominal Interest:*						
State1:	0.0181**	-0.06	-0.013**	0.003	0.001	0.036**
State 2:	0.317*	0.520**	0.024	0.040*	-0.288	0.367
∆*Relative Real Interest Rate*						
State1:	0.003	0.016	-0.003	0.002*	-0.002	0.001
State 2:	0.046*	0.029	-0.006	0.004**	0.158*	-0.155*
∆*Commodity Price Shock:*						
State1:	-0.150*	-1.115*	-0.024*	0.005	-0.01	0.065
State 2	-0.066	0.746	-1.357*	0.025	5.907*	4.497
Transition Probability:						
P11:	0.97	0.97	0.91	0.87	0.93	0.97
P22:	0.94	0.75	0.00	0.51	0.47	0.94
Expected Duration:						
State 1:	39.42	29.04	11.71	7.47	13.99	39.70
State 2:	18.14	3.96	1.00	2.04	1.89	17.35
Standard Deviation (Sigma):	2.19	15.00	1.17	0.35	9.15	5.98
AIC:	5.541	9.478	4.460	2.368	8.734	7.591
HQIC:	5.771	9.708	4.690	2.598	8.964	7.821
SBIC:	6.214	10.151	5.134	3.041	9.408	8.265
Log Likelihood:	-79.196	-146.128	-60.827	-25.255	-133.48	-114.057
No. of Observations:	34	34	34	34	34	34

Source: Author's Estimation and Stata 14 Output

. The results of the regressions are displayed in Table 6.8 and 6.9 below. For the FPMM model estimations, Ghana, Guinea and Sierra Leone generated the transition probabilities, each of 0.93 and respective expected durations of 13.80, 14.18 and 14.23 years. Liberia, which exhibited the lowest probability of 0.01 in the first regime, displayed the highest of the second regime probability at 0.90 translating into the longest 10.38 years. Ghana has the lowest process volatility of 1.21, the best fitted FPMMs that gave the best estimation results.

Table 6.8: Comparative Statistics and Fundamental Coefficients of Markov Switching Dynamic Regressions (Nigerian Naira/WAMZ Currencies)

Annual Data Flexible Price Monetary Model					
Fundamentals	***Gambia***	***Ghana***	***Guinea***	***Liberia***	***S/Leone***
∆*Relative Money Supply:*					
State 1:	0.572	-0.160	-0.004	75.522*	0.006
State 2:	34.787*	3.430	-0.051*	3.942**	-0.785
∆*Relative Real Income:*					
State1	8.064**	1.832	-1.831	-33.032	1.149
State 2	620.555*	-0.120*	-97.181*	-6.126	-79.95*
∆*Relative Nominal Interest:*					
State1:	-0.022	-0.770*	-0.007	9.434*	0.036
State 2:	6.310*	0.398*	-1.537*	-0.084	-0.325**
∆*Commodity Price Shock:*					
State1:	0.029	-0.337	-0.193	-15.230*	0.102
State 2:	11.067*	0.397	2.630*	0.880	4.255*
Transition Probability:					
P11:	0.93	0.57	0.93	0.01	0.93
P22:	0.73	0.62	0.30	0.90	0.74
Expected Duration:					
State 1:	13.80	2.31	14.18	1.00	14.23
State 2:	3.71	3.22	1.43	10.38	3.84
Standard Deviation (Sigma):	38.64(6.08)	1.21(4.55)	4.12	32.46	6.57
AIC:	8.830	6.809	6.961	10.957	7.921
HQIC:	9.045	7.021	7.160	11.156	8.121
SBIC:	9.459	7.450	7.554	11.541	8.505
Log Likelihood	-136.117	-94.938	-105.332	-173.277	-121.666
No. of Observations:	34	32	34	34	34

Source: Author's Estimation and Stata 14 Output

In the regressions of the RIDMM, Sierra Leone recorded the highest probability of remaining in the current regime at 0.93, with the longest expected duration of 14.26 years; and followed by Guinea and The Gambia, both at 0.93 probabilities with 13.02 and 12.41 years expected durations respectively. At regime 2, Sierra Leone also recorded the highest probability of 0.93 of remaining in the current regime, with the longest duration of 13.58 years. As we had in the FPMM for the Nigerian naira based exchange rates, Ghana generated the least process standard deviation of 2.62 for the RIDMM estimations as well as the best fitted model in the ML procedures and the best results given the lowest AIC, HQIC and SBIC statistics.

Table 6.9: Comparative Statistics and Fundamental Coefficients of Markov Switching Dynamic Regressions (Nigerian Naira/WAMZ Currencies)

Annual Data Real Interest Rates Differential Monetary Model					
Fundamentals	***Gambia***	***Ghana***	***Guinea***	***Liberia***	***S/Leone***
∆*Relative Money Supply:*					
State 1:	-1.672	-0.004	0.000	73.788*	0.002
State 2:	74.157*	0.124**	-0.867*	3.634**	0.782
∆*Relative Real Income:*					
State1	14.892	-4.873	2.254	-34.590	1.222
State 2	333.62**	25.954*	-96.410*	-6.922**	-79.481*
∆*Relative Nominal Interest:*					
State1:	0.116	0.014	0.007	8.668*	0.035
State 2:	4.035*	-0.306*	-1.491*	0.108	0.320**
∆*Relative Real Interest Rate:*					
State1:	0.103	-0.05*	-0.002	-0.393*	0.000***
State 2:	0.212*	-0.02*	0.017*	-0.005	0.002
∆*Commodity Price Shock:*					
State1:	0.430	0.045	0.250**	-8.789*	0.102
State 2	-20.170	0.393**	2.437	0.820**	4.244*
Transition Probability:					
P11:	0.92	0.69	0.92	0.53	0.93
P22:	0.30	0.51	0.29	0.93	0.74
Expected Duration:					
State 1:	12.41	2.31	13.02	2.13	14.26
State 2:	1.43	3.22	1.41	13.58	3.88
Standard Deviation (Sigma):	32.24	2.62	3.80	20.38	6.57
AIC:	11.190	6.809	6.918	10.278	8.038
HQIC:	11.420	7.021	7.150	10.508	8.268
SBIC:	11.864	7.450	7.593	10.951	8.712
Log Likelihood	-175.23	-89.407	-105.332	-159.726	-123.537
No. of Observations:	34	32	34	34	34

Source: Author's Estimation and Stata 14 Output

The implications of high probability of remaining within the same regime for a country's currency is infrequent switches from one regime to another. From the results of the MSD regressions of the PFMM and RIDMM of the US dollar exchange rates, we can infer that The Gambia dalasi, the Nigerian naira and Sierra Leonean leone have transition probabilities higher than others implying long expected durations. However, these failed to hold for The Gambian dalasi in the Nigerian naira exchange rates estimations in which Sierra Leonean leone took the lead. The disturbing observation was that many of the coefficients of the fundaments in the two models estimations do not yield the expected and there are more statistically significant fundamental coefficients in the second regime than the first regime outcomes.

For the quarterly data evaluation of the FPMM and RIDMM in the WAMZ, the results of the unit root tests of all the variables employed are exhibited in Table 6.10 below. These results reflects mixed orders of integration. Majority of these variables are non-stationary. Except for two exchange rate variables (The Gambia/Sierra Leone and Liberia/Sierra Leone), nominal exchange rate variables and commodity price index variables are all stationary.

Table 6.10: Results of ADF Unit Roots Tests of Exchange Rates Determination Variables of the WAMZ

Home & Foreign Country	*Exchange Rate*	*Money Supply*	*Formal Real Income*	*Interest Rate*	*Inflation Differential*	*Informal Real Income*	*Commodity Price Index*
GAMBIA							
Ghana:	-1.490	-0.087	-0.235	2.185	-3.644*	-0.732	-1.098
Guinea:	-1.269	-0.947	3.904*	-1.604	-2.979**	-2.020	-1.063
Liberia:	-2.103	-1.866	4.460*	-0.759	-1.8613	-3.563*	-0.887
Nigeria:	-2.191	-1.574	-2.717**	-1.758	-3.719*	-0.981	-1.815
S/Leone:	-3.164**	-0.379	-0.907	-1.022	-2.721*	-2.732**	-3.098*
GHANA							
Gambia:	-1.490	-0.087	-2.275	-2.185	-3.644*	-0.733	-1.098
Guinea:	-1.461	-1.408	-0.235	-0.883	-3.343*	-1.608	-1.312
Liberia:	-2.281	-2.250	-4.160*	-1.584	-2.594***	-4.427*	-1.312
Nigeria:	-1.592	-0.377	-1.824	-3.906*	-4.815*	-1.832	-2.297
S/Leone:	-1.520	-0.434	-2.692	-1.798	-4.670*	-0.796	-1.095
GUINEA							
Gambia:	-1.269	-1.408	-3.904*	-1.604	-2.999**	-2.019	-1.063
Ghana:	-1.461	-0.947	-0.518	-0.883	-3.343*	-1.608	-1.312
Liberia:	-1.134	-2.270	-4.638*	-1.869	3.914*	-4.625	-1.312
Nigeria:	-1.609	-3.117**	-1.001	-1.230	4.384*	-1.449	-1.312
S/Leone:	-1.936	2.723***	-2.238	-1.592	1.715	-1.741	2.282
LIBERIA							-0.887
Gambia:	-2.103	-1.866	-4.460*	-0.758	1.861	-3.563*	-1.312
Ghana:	-2.281	-2.250	2.717**	-1.584	2.594***	-4.427*	-1.312
Guinea:	-1.134	-2.270	-4.638*	-1.869	3.914*	-4.625*	-1.312
Nigeria:	-2.208	-2.601***	-3.096**	-3.083**	2.713***	-3.299*	-1.954
S/Leone:	-3.183**	-2.714***	-3.290*	-1.555	2.071	-3.277*	-0.683
NIGERIA							
Gambia:	-2.191	-1.574	-0.907	-1.758	3.719*	-0.981	-1.815
Ghana:	-1.434	-0.377	-1.824	-3.905*	4.815*	-1.832	-2.297
Guinea:	-1.608	-3.117**	-1.001	-1.230	4.384*	-1.449	-2.282
Liberia:	-2.208	-2.601***	-3.096*	-3.014**	2.713**	-3.299*	-1.954
S/Leone:	-2.288	2.683***	-2.213	-1.497	3.858*	0.103	-1.843
S/LEONE							
Gambia:	-3.164**	-0.380	-2.275	-1.022	2.721***	-2.732**	-3.098**
Ghana:	-1.520	-0.434	-2.692**	-1.798	4.670*	-0.796	-1.095
Guinea:	-1.936	2.723***	2.238	-1.591	1.715	-1.741	-1.040
Liberia:	-3.183**	2.714***	-3.290*	-1.355	2.071	-3.277*	-0.683
Nigeria:	-2.288	2.683***	-2.213	1.497	3.858*	0.103	-1.843

Source: Author's Estimations and EView 10 Output

These results have implication for long-run relationship assessment because cointegration tests require all variables to be stationary. If these time series variables are of different orders

of integration, there cannot be long run relationships and by implications, there cannot be cointegration. In order to verify this assumption, applying quarterly data, this study carried out three residual-based cointegration tests of the relationships in the FPMM and RIDMM (Phillips-Oualiaris, Engle-Granger and Park's Added Variable tests) on the residuals of the estimates of FMOLS cointegrating regressions.

Table 6.11: Results of Cointegration Tests for FPMM Exchange Rates and Fundamentals in the WAMZ

		Phillips-Oualiaris Tests		***Engle-Granger Tests***		***Park's Added Variable Tests***
Home Country	**Foreign Country**	***tau-statistics***	***z-statistics***	***tau-statistics***	***z-statistics***	***Chi-Square***
GAMBIA	***Ghana***	-4.2644	-34.8145***	-4.7296***	-46.2723*	4.4676**
	Guinea	-4.2866	-27.6101	-4.2444	-27.5379	7.1792*
	Liberia	-3.8466	-24.7272	-3.5542	-59.6930*	0.0057
	Nigeria	-3.5058	-21.9782	-3.2145	-18.2674	2.0873
	S/Leone	-3.4620	-22.6037	-3.6094	-26.4736	0.5426
GHANA	***Gambia***	-4.2644	-34.8144**	4.7297***	-46.2724*	4.4676**
	Guinea	-3.6801	-23.4686	-3.4920	-21.1204	0.0288
	Liberia	-4.1760	-30.5085	-4.3934	88.7412*	37.5387*
	Nigeria	-3.8472	-3.5925	-23.1743	-26.6976	0.0148
	S/Leone	-3.8461	-28.8650	-4.2194	-39.1089**	0.3606
GUINEA	***Gambia***	-4.2886	27.6101	-4.2444	-27.5379	7.1792*
	Ghana	-3.6801	-23.4686	-3.4920	-21.1204	0.0288
	Liberia	-3.4475	-18.1775	-3.4276	-18.3140	1.8616
	Nigeria	-3.5080	-21.1241	-4.1117	35.2443**	1.8871
	S/Leone	-3.3443	-20.4331	-3.0625	-14.1025	0.2384
LIBERIA	***Gambia***	-3.8466	-24.7272	-3.5542	59.6930*	0.0058
	Ghana	-4.1760	-30.5085	-1.3934	-88.7412*	37.5387*
	Guinea	-3.4475	-18.1775	-3.4275	-18.314	1.8616
	Nigeria	-3.0905	-19.1442	-3.2087	-21.9772	2.8405***
	S/Leone	-3.4430	-23.4745	-3.3912	-74.0705*	
NIGERIA	***Gambia***	-3.5058	-21.9782	-3.2148	-18.2674	2.0873
	Ghana	-3.8472	-26.6976	-3.5925	-23.1743	0.0148
	Guinea	-3.5080	-21.1240	-4.1117	-35.2443**	1.8871
	Liberia	-3.0905	-19.1442	-3.2087	-21.9772	2.8404***
	S/Leone	-3.5678	-22.8613	-3.2180	-18.2893	14.0251*
S/LEONE	***Gambia***	-3.4620	-22.6067	-3.6094	-26.4735	0.5426
	Ghana	-3.8461	-28.8650	-4.2194	-39.1089**	0.3606
	Guinea	-3.3443	-20.4331	-3.0624	-17.1025	0.2384
	Liberia	-3.4430	-23.4750	-3.3912	-74.0705*	9.7987*
	Nigeria	-3.5678	-22.8613	-3.2179	-18.2893	14.0251*

Source: Author's Estimations and EView 10 Output

The results of the FPMM and RIDMM cointegration tests are displayed Tables 6.11 above and 6.12 below respectively, where Phillip-Oualiars and Engle-Granger tests clearly revealed at 5% significance level, the null hypothesis that the series are not cointegrated cannot be rejected. What this implies is that there are no long run relationships from all directions of the

bilateral relationships investigated. This thus confirmed what the general results of the unit roots tests denote. The connotation of 'no cointegration' between exchange rates and the fundamentals as revealed in these FPMM and RIDMM models of exchange rate determination in the cases of the foreign exchange bilateral relationships across the WAMZ is that the monetary fundamentals of money supply, formal nominal output, informal nominal output, inflation, interest rates as a well as commodity price in both monetary models do not affect exchange rates in the long run, though they may do in the short-run.

Table 6.12: Results of Cointegration Tests RIDMM Exchange Rate and Fundamentals in the WAMZ

		Phillips-Oualiaris Tests		***Engle-Granger Tests***		***Park's Added Variable Tests***
Home Country	**Foreign Country**	***tau-statistics***	***z-statistics***	***tau-statistics***	***z-statistics***	***Chi-Square***
GAMBIA	***Ghana***	-2.7074	-12.9736	-4.6988	-45.6813**	3.0203***
	Guinea	-4.2867	-27.6646	-4.2396	-27.4966	5.8363***
	Liberia	-4.9019***	-42.4387**	-3.6245	-54.6091	2.2429
	Nigeria	-3.5541	-22.7469	-3.2603	-18.9580	0.0227
	S/Leone	-3.5709	-23.9763	-3.7879	-28.9101	0.0497
GHANA	***Gambia***	-2.7074	-12.9736	-4.6988	-45.6813**	-3.0203***
	Guinea	-3.6669	-22.9318	-3.4528	-20.1925	2.5968***
	Liberia	-4.0102	-27.0140	-4.2720	-69.2145*	86.2247*
	Nigeria	-3.8003	-26.0786	-3.5475	-22.6233	0.0957
	S/Leone	-3.0307	-15.9841	-4.7316	-47.7123**	0.5009
GUINEA	***Gambia***	-4.2867	-27.6646	-4.2396	-27.4967	-5.8363**
	Ghana	-3.6669	-22.9318	-3.4528	-20.1925	-2.5968***
	Liberia	-3.8341	-24.4380	-3.8630	-25.4275	-31.5968*
	Nigeria	-3.7672	-24.9817	-4.1116	-35.2429***	2.1581
	S/Leone	-3.7717	24.0565	-3.5901	-21.7325	0.1084
LIBERIA	***Gambia***	-4.9019***	-42.4387***	-3.6245	-54.6091*	2.2429
	Ghana	-4.2010	-30.2506	-4.2720	-69.2145*	86.2247*
	Guinea	-3.8341	-24.4380	-3.8630	-25.4275	31.9363*
	Nigeria	-3.0538	-18.7378	-3.1873	-21.6174	3.9340**
	S/Leone	-3.5825	-25.0867	-3.3428	-70.2468*	22.9438*
NIGERIA	***Gambia***	-3.5541	-22.7469	-3.2603	-18.9580	0.0227
	Ghana	-3.8003	-26.0786	-3.5475	-22.6233	0.0957
	Guinea	-3.7672	-24.9817	-4.1116	-35.2429***	2.1581
	Liberia	-3.0538	-18.7378	-3.1873	-21.6174	3.9340**
	S/Leone	-3.7452	-25.4206	-3.2393	-18.5031	13.1894*
S/LEONE	***Gambia***	-3.5709	-23.9763	-3.7879	-28.9101	0.0497
	Ghana	-3.0307	-15.9841	-4.7316	-47.7123*	0.5009
	Guinea	-3.7717	-24.0565	-3.5901	-21.7325	0.1684
	Liberia	-3.5825	-25.0867	-3.3429	-70.2468	-22.9438*
	Nigeria	-3.7452	-25.4206	-3.2393	-18.5030	-13.1894*

Source: Author's Estimations and EView 10 Output

The fully modified ordinary least square (FMOLS) estimation results of the quarterly data FPMM for both directions of bilateral exchange rate relationships across the WAMZ are exhibited in Table 6.13 below showing the explanatory powers and signs yielded by the

fundamentals. The outputs show that differentials of money supply and interest rates are hugely significant at 10% level of significance except for the cases of Nigeria/Sierra Leone money supply as well as the interest rate differential cases of Ghana/Liberia Guinea/Nigeria and Liberia/Nigeria, and these were also the three cases in which interest rate differentials failed to yield the hypothesised positive signs.

Table 6.13: Results of FMOLS Estimations of Explanatory Powers and Theoretical Signs of the Fundamentals in FPMM Exchange Rates in the WAMZ

Home Country	Foreign Country	*Money Supply Differential*	*Formal Output Differential*	*Interest Rate Differential*	*Informal Output Differential*	*Commodity Price Differential*
GAMBIA	***Ghana***	1.2400*	-1.8708*	0.1610*	-0.0839	-0.3104**
	Guinea	0.3367***	0.3490	0.4478*	-0.1476	0.1723
	Liberia	0.3051*	-0.0308	0.3140*	-0.2832	-0.3874
	Nigeria	0.3662***	-4.6418*	0.1632***	2.010*	1.4046*
	S/Leone	0.8141*	-0.6400*	0.1242*	-0.3799***	0.6558
GHANA	***Gambia***	1.2401*	-1.8708*	0.1610*	-0.0840	-0.3104**
	Guinea	0.6273*	1.3419**	0.2453*	-0.3972***	-0.3972***
	Liberia	0.5944*	3.7715**	-0.0843	-4.5048**	0.7887*
	Nigeria	0.8345*	-3.1073**	0.3132*	2.9818	0.4516***
	S/Leone	1.2709*	0.3172	0.1339*	-0.3659	-0.3800***
GUINEA	***Gambia***	0.3367***	0.3490	0.4478*	-0.1476	0.1724
	Ghana	0.6273*	1.3419**	0.2453*	-0.3972***	-5.0024*
	Liberia	0.3561***	0.5227	0.2038*	-0.2071	1.3027*
	Nigeria	0.2320**	-2.8950*	-0.0362	1.4000*	-0.9491*
	S/Leone	0.8957*	0.2465	0.1731*	-0.6615**	0.2438
LIBERIA	***Gambia***	0.3051*	-0.0308	0.3140*	-0.2832	-0.3894
	Ghana	0.5944*	3.7715**	-0.0843	-4.5048**	0.7887*
	Guinea	0.3561**	0.5227	0.2038*	-0.2071	1.3027
	Nigeria	0.3384**	1.2745	-0.0573	-2.2115	0.6314**
	S/Leone	0.4100*	0.6825**	0.2633*	-1.2596*	-0.3116
NIGERIA	***Gambia***	0.3661***	-4.6418*	0.1632***	2.0097*	1.4046*
	Ghana	0.8345*	-3.1043**	0.3132*	2.9818	0.4516***
	Guinea	0.2320**	-2.8950*	-0.0362	1.4000*	-0.9491*
	Liberia	0.3384**	1.2747	-0.0573	-2.2115	0.6314**
	S/Leone	-0.1442	1.7723**	0.2195*	-2.7639*	0.9718*
S/LEONE	***Gambia***	0.8141*	-0.6400*	0.1241*	-0.3799***	0.6558
	Ghana	1.2709*	0.3172	0.1339*	-0.3659	-0.3800***
	Guinea	0.8957*	0.2465	0.1731*	-0.6615**	0.2438
	Liberia	0.4100*	0.6825**	0.2633*	-1.2596*	0.1315
	Nigeria	-0.1442	1.7723**	0.2195*	-2.7639*	0.9718*

Source: Author's Estimation and EViews 10 Output

The only relationship where the expected signs failed to reflect in the relative money supply is the Nigeria/Sierra Leone case. Apart from the cases of The Gambia/Ghana and Sierra Leone/ Ghana, the explanatory powers of money supply were lower than unity as hypothesised. Both formal and informal output differentials yielded some few expected negative signs, but with better results by informal output differential. The explanatory powers

of these two fundamentals were huge in relationships involving Ghana and Nigeria which are the strong economies of the WAMZ. These quarterly data FPMM estimations results were closely similar to what were obtained for the annual data estimations of the model.

Table 6.14: Results of FMOLS Estimations of Explanatory Powers and Theoretical Signs of the Fundamentals in RIDMM Exchange Rates in the WAMZ

Home & Foreign Country	*Money Supply Differential*	*Formal Output Differential*	*Interest Rate Differential*	*Inflation Differential*	*Informal Output Differential*	*Commodity Price Differential*
GAMBIA						
Ghana:	1.2743*	-1.8848*	0.1553*	0.0005	-0.1601	-0.3425***
Guinea:	0.2786	0.4070	0.4107*	0.0024	0.0757	0.2356
Liberia:	0.3210*	0.4233	0.3759*	0.0133**	0.0972	-0.8184
Nigeria:	0.3959**	-3.8340*	0.1238	-0.0062**	1.4448*	1.1271*
S/Leone:	0.8202*	-0.7036*	0.0981*	0.0026	-0.1341	0.6933
GHANA						
Gambia:	1.2743*	-1.8848*	0.1553*	0.0004	-0.1601	-0.3425**
Guinea:	0.5950*	1.2566**	0.1740*	0.0048***	-0.0933	-5.2977*
Liberia:	0.6548*	3.3288***	-0.1314	0.0034	-4.1695**	0.9278*
Nigeria:	0.8484*	-2.7666	0.2795*	0.0034	2.3848	0.5078***
S/Leone:	1.2555*	0.2332	0.0887**	0.0029	0.0801	-0.4879**
GUINEA						
Gambia:	0.2786	0.4070	0.4107*	0.0024	0.0757	0.2357
Ghana:	0.5950*	1.2566**	0.1740*	0.0047***	-0.0933	-5.2977*
Liberia:	0.1306	0.2845	0.1117**	0.0131*	-0.0521	1.7475*
Nigeria:	0.2476***	-2.8898*	-0.0353	-0.0005	1.3913*	-0.9744*
S/Leone:	0.7637*	0.0068	0.1077*	0.0060*	-0.2273	0.2400
LIBERIA						
Gambia:	0.3210*	-0.4233	0.3759*	0.0133**	0.0972	-0.8184***
Ghana:	0.6548*	3.3288***	-0.1314	0.0034	-4.1695**	0.9278*
Guinea:	0.1306	0.2845	0.1117**	0.0131*	-0.0521	1.7475*
Nigeria:	0.3046***	0.4184	-0.0005	-0.0060	-1.1891	0.5252
S/Leone:	0.4190*	0.7437*	0.2737*	0.0008	1.3250*	0.3339
NIGERIA						
Gambia:	0.3959**	-3.8340*	0.1238	-0.0062**	1.4448*	1.1271*
Ghana:	0.8484*	-2.7666	0.2795*	0.0033	2.3848	0.5078***
Guinea:	0.2476**	-2.8898*	-0.0353	-0.0005	1.3973*	0.9744*
Liberia:	0.3046***	0.4184	-0.0005	-0.0060	-1.1891	0.5252
S/Leone:	-0.0062	1.4734**	0.2134*	-0.0036	-2.9376*	1.0631*
S/LEONE						
Gambia:	0.8201*	-0.7036*	0.0981*	0.0026	-0.1341	0.6933
Ghana:	1.2555*	0.2322	0.0887**	0.0030	0.0801	-0.4879**
Guinea:	0.7638*	0.0068	0.1077*	0.0060*	-0.2273	-0.2400
Liberia:	0.4190*	0.7437*	0.2737*	0.0008	-1.3250*	0.3339
Nigeria:	-0.0062	1.4734**	0.2134*	-0.0036*	-2.9376*	1.0631*

Source: Author's Estimations and EView 10 Outputs

On the overall here, it could be inferred that there were a good number of similarities in explanations offered by these fundamentals about exchange rate determination in the WAMZ, however, these explanations were not convincing enough to justify a conclusion that the FPMM was strongly valid across the WAMZ. The results of the RIDMM estimations in

Table 6.14 above reveals that as obtained in the FPMM estimation results in Table 6.13 above, the differentials of money supply and interest rate reflected the hypothesised signs, with one exception in money supply differentials and three exceptions in interest rate differentials On inflation differentials, apart from some negative signs yielded for the Nigeria based relationships, the hypothesised positive signs were generated for other relationships. Output differentials (formal and informal) recorded few instances of expected signs. The number of coefficients with statistical significance (at 5%) were sparse. Generally, going by the results of the estimations of the RIDMM, apart from money supply and interest rate differentials, it is apparent that the FPMM performed better than the RIDMM in the WAMZ. The explanatory powers of inflation differentials were the lowest across the WAMZ. This signified the low extent of the influence of real inflation on exchange rates determination; although, most of these coefficients lack economic meanings due to their statistical insignificance. Further to these, the evidence of the failure of cointegration of gathered in this section caused the conclusion that there are no long-run cointegrating relationships between exchange rates and the fundamentals across the WAMZ.

The FPMM and the RIDMM estimations results under these quarterly data assessments highlighted that there were some few similarities in signs and magnitude of the explanations offered by exchange rate determination fundamentals across the WAMZ. These similarities were not strong enough to confidently infer that a single foreign exchange market can suffice for the WAMZ countries. Given the possibility that the proposed monetary union's foreign exchange markets is likely to be built around Nigeria, a detailed look at the output of the Nigeria based exchange rate and the associated explanatory variables in both monetary models estimated shows that they were not encouraging due to the signs and explanatory powers and statistical significance of coefficients of these explanatory variables. Therefore, if

the WAMZ should adopt a single exchange rate in a common foreign exchange market, this step should be taken with cautiously.

6.3 Exchange Market Pressure

In attempts to stabilise international reserve positions towards avoiding unpleasant movements in their rate of foreign exchange, monetary authorities have been experiencing foreign exchange market pressure since the beginning of the managed floating regime in the early 70s, When central banks face market pressure of this nature, the monetary model holds for exchange rates in flexible regime alone and are not likely to hold for exchange rates in a market pressurised regime. Therefore, the monetary model of exchange rate determination requires modification that would take exchange market pressure into cognisance. Furthermore, it is crucial for the monetary authority under a managed floating regime to determine the degree at which its monetary independence is being affected by exchange rate target. The currency crises around the world and the impact on the real economy as well as the contagious effects prompted the need for economic stability in which exchange rate stability is playing a crucial role. In monetary union formation process, exchange rates stability is a strong convergence criterion to fulfil by prospective members. One analytical tool appropriate for the measurement of the foreign exchange market condition and the stability of the market is exchange market pressure (EMP). Generally, exchange market pressure (EMP) relates to money market disequilibrium. This makes it important in driving the understanding of the mechanism and instrument that would assist in achieving the market equilibrium. Many different yardsticks have been developed and adopted to identify periods of crisis, out of which exchange market pressure (EMP) index has been of relative importance. Given the significance of this subject, there had been renewed theoretical and empirical attention towards ensuring that the question on whether financial crisis could be

forecast and/or prevented effectively by monetary policy.[102] These make research analysis on exchange market pressure in WAMZ member countries to be significant.

This section of the thesis chapter on exchange market pressure identified currency risks period (or otherwise) in the WAMZ and further tests the response of exchange market pressure to monetary policy related factors in these countries as well as movements in primary commodity prices, given the feature of these countries as primary commodity exporting countries. These revealed the statistically and econometrically determined exchange rate stability over the years as well as the susceptibility of these countries to currency crisis. This study is novel in that there is no know or existing literature that has applied exchange market pressure in the assessment of monetary integration; and specifically in the evaluation of the WAMZ as a monetary union.

The first phase of the EMP analysis in this section employed the model-independent statistical method of Eichengreen, Rose and Wyplosz (1996) to derive EMP indices in determining currency crisis susceptibility of the countries under study. The second part assessed the response of EMP to monetary policy across the WAMZ as well as evaluate the similarities in the patterns and strengths of the response of EMP towards checking for compatibility across the WAMZ countries. In this respect, the Girton and Roper (1977) model of exchange market pressure was applied in the model-dependent estimations for the six countries under study. The specific aim was the investigation of the nature of the response of EMP to monetary variables to changes in domestic credit as scaled by base money; and to

[102] Many authors identified EMP analysis as one of the key tools in this respects. Some of these papers are Girton and Ropers (1977), Goldfajn and Gupta (1999), Sachs, Tornell and Velasco (1996), Eichengreen, Rose and Wyploz (1996), Kaminsky, Reinhart and Lizondo (1997), Bensiad and Jeanne (1997), Furman and Stiglitz (1998), Delke, Hsiao and Wang (1999), Bussiere and Mulder (1999), Tornell (1999), Kaminsky and Reinhart (1999), Drazen (1999), Gould and Kamin (2000), Ahluwalia (2000), Lahiri and Vegh (2000), Flood and Jeanne (2000), Tanner (2001).

check if the responses of the EMP to monetary policy stances across the WAMZ are homogeneous in pattern.[103] These were expected to reveal similarities or otherwise in monetary management and to show if monetary policy instrument of domestic credit/base money managed exchange rate pressures in the WAMZ in similar manner. It was also expected to show if the reaction to EMP by monetary policy instruments are according to theoretical presumptions in testing the validity of the monetary model of exchange market pressure.

6.3.1 Theory and Models

Exchange market pressure (EMP) depicts money market disequilibrium. Traditionally, the two major monetary approaches used in literature to assess money market disequilibrium are: (i) monetary approach to exchange rate; and (ii) monetary approach to balance of payments. While foreign reserves variation assists in restoring the equilibrium under the balance of payments' monetary approach, the change in exchange rate would cause the equilibrium restoration under the monetary approach to exchange rate (Frankel, 1976 and Mussa, 1976). Foreign reserves changes or exchange rate changes (one in isolation of the other) would not provide enough guide in revealing the features and accurate picture of the external account of any economy. For instance, monetary authority can delay or avoid depreciation in exchange rate (partially) if foreign reserves are depleted so as to inject foreign currency into the foreign market. On the other hand, foreign currency could be purchased from the market to fortify foreign reserves; and this restrains the appreciation in the rate of exchange as prompted by the underlying fundamentals. These show that there would be misleading view of external position of an economy if either of the two intervention tools (foreign reserves variations and

[103] Domestic credit is a more appropriate proxy for monetary policy in that it is directly controlled by monetary authorities. While domestic credit/base money is quantitative monetary management policy tool, interest rate is a market-based monetary management policy instrument. These two policy techniques have different implications.

exchange rate movements) to the exclusion of the other is emphasised. This makes a good case for a composite definition and description of EMP in the model-dependent assessment. This composite description of EMP incorporates foreign reserve variations and exchange rate changes in characterising the pressure in the exchange market. This is the starting point of the first seminal work on EMP by Girton and Roper (GR) 1977 in which an EMP model was developed to reflect exchange market pressure as a composite variable. The EMP values represents the magnitude of the foreign exchange market disequilibrium which should consequently be removed by respective change in exchange rate and/or change in foreign reserve position, depending on the ruling exchange rate regime.

Exchange market pressure are measured in two ways as: (i) model-independent and (ii) model-dependent. The model independent exchange market pressure index (EMPI) measures the extent of contagion-caused market pressure on a currency vulnerability of a country to currency crisis. For a proposed currency union, it reveals if the macroeconomic fundamentals of intending members are strong for single currency and single exchange rate in exchange rate integration and further, if the underlying macroeconomic variables can withstand market tensions and exchange rate regime vulnerabilities that may arise in the future monetary union. The weighted exchange market pressure index (EMPI) appropriate for the measurement of the extent of currency pressure is expressed as:

$$EMPI_{it} = \left(\frac{1}{\alpha}\%\Delta e_{i,t}\right) + \left(\frac{1}{\beta}\Delta\left(i_{i,t} - i_t^*\right) - \left[\frac{1}{\gamma}\left(\%\Delta r_{i,t} - \%\Delta\, r_t^*\right)\right]\right. \qquad 6.26$$

where $e_{i,t}$ is the price of a relative foreign currency in terms of country $i's$ currency at time t. $i_{i,t}$ is the nominal interest of country i at time t; i_t^* is the foreign country's nominal interest rate, $r_{i,t}$ is the nominal interest of country i at time t; r_t^* is the ratio of international reserves to narrow money supply (M1) in the foreign country while α, β, and γ are the respective standard deviations appropriately applied as weights. This measure of market pressure takes

its roots from the idea that when there are excess demand and supply in a foreign exchange market, there can be changes in foreign exchanges price as well as changes in reserve level.

The model-dependent study focusses on developing a model that provides links between EMP and monetary policy in order to check if EMP responds to monetary policy in the right manner (according to theoretical underpinnings). Basically, the Girton-Roper model of EMP is a variant of the monetary approach to exchange rate determination. The model is based on monetary approach to balance of payment which revolves around the notion of demand for money and supply of money. The idea within the monetary approach to balance of payment is that excess money supply causes international reserve losses under the fixed exchange rate regime and by implication, this leads to balance of payments deficits. Under flexible exchange rate regime, currency depreciation absorbs the pressure on balance of payments. Therefore, the need for equilibrium between domestic money supply and money demand necessitate the evolution of the exchange market theory. Naturally, excess money supply causes increases in demand for goods and services (the implication of demand-pull inflation) which translates into increase in economic agents' demands for foreign goods and services and this in turn, causes reserve depletion in the domestic market. The modelling of exchange market pressure therefore assesses whether or not monetary authority absorbs pressure in the foreign exchange market by drawing down (depleting) reserves or by currency depreciation. The principal theoretical proposition of the modelling of EMP by Girton and Roper (1977) is that whenever the domestic money market equilibrium is disturbed, the resulting disequilibrium is restored through some combinations of international reserve outflows (or inflow) and depreciation (or appreciation) of currency. Therefore, to restore the money market disequilibrium, the excess domestic money demand will prompt a combination of reserve depletion (outflow) and depreciation of currency. In the instance of excess domestic money supply, the consequence will be some combinations of inflow of reserves and

appreciation of currency. This is a strong reason for the appropriateness of the G-R model of EMP in the fixed, managed floating and floating exchange rate regimes. Under the fixed exchange rate regime, the change in exchange rate is zero and under a floating/flexible exchange rate regime, the change in reserve is zero. Either of reserve losses and currency appreciation (or a combination of both) absorbs exchange market pressure under the managed floating system.

The basic 'implicit' and 'explicit' conditions for the G-R model are: (i) the money market equilibrium condition; and (ii) the imposition of the purchasing power parity (PPP). Therefore in deriving the G-R model, it is necessary to begin with the formulation of the money market and the PPP. In the first instance, for equilibrium in the money market to hold, it is necessary to have:

$$M^d = M^s \tag{6.27}$$

where M^d is the demand for money and M^s is money supply. Money demand and money supply can further be specified as:

$$M^d = kPY \tag{6.28}$$

and

$$M^s = m(B) \tag{6.29}$$

where is k a constant, P is domestic price level, Y is real output, m is money multiplier and is B monetary base. This makes money supply to be the product of money multiplier (m) and monetary base (B) in a functional relationship in which:

$$B = R + D \tag{6.30}$$

Where R is net foreign assets (which is the foreign component of monetary base) and D is domestic credit (which is the domestic component of monetary base). In working towards the derivation of the G-R model, the PPP theory is incorporated at this point:

$$E = \frac{P^*}{P} \quad 6.31$$

or

$$P = E(P^*)$$

where E is the nominal exchange rate, P is the domestic price level and P^* is the foreign price level. It is important to note here that the nominal exchange rate in this modelling is the number of units of foreign currency per unit of domestic currency. If Equation 6.28 and 6.29 above are substituted into Equation 6.27 above, we will have:

$$kPY = m(R + D) \quad 6.32$$

If the equivalent of P in Equation 6.35 above is made to substitute for P, in Equation 6.36, this yields:

$$k\left(\frac{P^*}{E}\right)Y = m(R + D) \quad 6.33$$

Assuming that people hold a fraction of nominal income in the form of cash, as constant k, we can express Equation 6.33 in percentages form thus:

$$P^* - e + y = m + r + d \quad 6.34$$

where P^* is percentage change in foreign price level, e is percentage change in nominal real exchange rate, y is percentage change in real output, a is percentage change in money multiplier, r is percentage change in reserve and d is percentage change in domestic credit. The rearrangement of the terms in Equation 6.34 leads to the G-R exchange market pressure model expressed as:

$$r + e = P^* + y - m - d \quad 6.35$$

where $(r + e)$ represents exchange market pressure.

The intuition of the G-R model is that increase in domestic credit (and/or money multiplier): (i) stimulates proportionate loss of foreign reserve (with no change in exchange rate); or (ii) stimulates a proportionate depreciation of domestic currency (with no change in reserve) or

(iii) a combination of the two, all at a given rates of growth of domestic income and foreign prices. On the other hand, when there is increase in domestic income and/or foreign price, the effect is proportional inflow of international reserves and proportional appreciation of domestic currency. It is established in literature that Equation 6.39 could be augmented with a variable b, which is $\left(\frac{e}{r}\right)$ in order to check the response of monetary authority in the absorption of exchange market pressure through the draw-down of reserve or by exchange rate depreciation. The augmented equation becomes:

$$r + e = P^* + y - a - d + b \qquad 6.36$$

When the coefficient of b is positive and significant, this means that currency depreciation is applied by the monetary authority to absorb exchange market pressure. A negative and significant coefficient of b shows that reserve depletion is the tool employed by monetary authority in the absorption of exchange market pressure. When the coefficient of b is insignificant, this is an indication of the lack of sensitivity of monetary authority to these components of exchange market pressure.

6.3.2 Data and Methods

The evaluation of exchange market pressure in the WAMZ employed the use of both annual and monthly data of the WAMZ countries under assessment as well as the CPI inflation data of the US. These data spanning between 2001 and 2015 and sourced from the databases of the EIU, the IMF and the World Bank, are for nominal interest rates, international reserves, nominal exchange rate (US dollar), domestic credit, narrow money supply, net foreign assets and real GDP. For the construction of the exchange market pressure index (EMPI), related annual data (2001 to 2014) were applied while monthly data (2001M1 to 2015M12) which were converted from the sourced annual data were used in the case of model dependent analysis of exchange markets pressures across the WAMZ. EMPI were constructed for each

of the WAMZ member countries within the contexts of the US dollar and the Nigeria naira foreign exchange markets in the WAMZ. The span of the period for the exchange market pressure estimations were made shorter so as to avoid the possible distorting influences and effects of the civil wars in Liberia and Sierra Leone on their exchange markets as well as other exchange markets within the zone. Variables involved in the construction of the EMPI were relatively measured against those obtained in the US (for the US dollar/WAMZ exchange rates) and in Nigeria, the strongest WAMZ economy (for the Nigerian naira/WAMZ countries exchange rates).[104] For each WAMZ country, currency crisis thresholds were estimated as the sum of the standard deviation and mean of the weighted exchange market pressure index derived from the estimation of Equation 6.30 over the sample period thus:

$$T = \sigma_{EMPI} + \mu_{EMPI} \qquad 6.41$$

where T indicated threshold while σ and μ denote the EMPI sample standard deviation and mean respectively. This links crisis with the extent of volatility and the average pressure in the foreign exchange market. A country is therefore susceptible to currency crisis if the weighted EMPI is greater than the applied threshold. There are no arbitrary weighting of market volatilities and averages as many researchers did. This was perceived inappropriate for the exchange market realities in developing economies, the category in which the WAMZ countries belong. In determining if the WAMZ countries are currency crisis vulnerable, this research work applied the following five different currency crisis thresholds situation for the WAMZ countries: (i) WAMZ country-specific threshold (US dollars exchange markets); (ii) WAMZ country-specific threshold (Nigerian naira exchange markets); (iii) WAMZ average

[104]Nigeria is the strongest economy with over 80% of the zone's total GDP and by implication forming around same proportion of the total size of the entire proposed monetary zone's foreign exchange markets.

threshold (US dollars exchange markets); (iv) WAMZ average threshold (Nigerian naira exchange markets); and (v) Nigeria currency crisis threshold.

For the model dependent EMP, robust regression method was applied in the estimation of Equations 6.39 and 6.40 above. A robust regression is that which: (a) is reasonably efficient and unbiased; (b) small deviation from the assumptions of the model will not substantially impair the performances of the estimated model; and (iii) large deviation does not invalidate the model completely. OLS regression is not robust with outliers because it can yield results that are misleading if such outliers are undetected. If outliers, influential observations and heavy-tailed distribution can hinder the efficiency of OLS regression, then an alternative in robust regression is appropriate. Robust statistics aim at describing the structure best fitting the bulk of the data, identify deviating data points (outliers) for further treatments, identify (or warn about) highly influential data points (leverage points), deal with unsuspected serial correlation. Consequently, robust regression devises estimators that are not so strongly affected by outliers in order to produce resistant results in the presence of outliers as it dampens the influences of outlying observations so as to provide better fit for the majority of the data and thereby achieve the necessary stability. Theoretically, what apply in explaining the performance of robust regression are the properties of efficiency, breakdown points and high leverage points.

The process of the evaluation of the model-dependent EMP across the WAMZ in this assessment started with the OLS estimation of the augmented EMP model as expressed in Equation 6.40, in order to check for outliers in the variables involved in the modelling of EMP for the six WAMZ countries. The output of the OLS estimations were not be reported since the purpose was to check for the possible presence of outliers in justifying the use of the robust least square (RLS) regression method for same purpose. The RLS estimation performed here used the M-estimation option (which has a function that provides less weight

to outliers) and applied the Welsch objective specification with Huber Type I covariance estimates (on which the z-statistics estimations are based) and zero-centered Median Absolute Deviation (MAD) estimator. MAD is regarded as a robust measure of central tendency and unlike mean and standard deviation, it is not sensitive to the presence of outliers. MAD is the median absolute value of the residuals (which are deviations from the median of the data), measuring statistical dispersions. Since standard deviation can easily be influenced by outliers because the distance from mean are squared in standard deviation, large deviations are consequently weighted heavily. However, with MAD applied here, deviations of outliers are not relevant. For the iteration control, this study allows for 500 maximum iteration and 0.0001 convergence. In robust least square (RLS) regression, R-squared and Rw-squared statistics are the two measures of goodness-of-fit. This study applied Rw-squared which was deemed a better measure of fit than the R-square reported in the RLS regression. One other special statistic reported by RLS is Rn-square statistic which is the robust version of the Wald test of the true value of the coefficients, based on sample estimate. This (calculated by applying the standard Wald test quadratic form) tests the hypothesis that all the coefficients are equal to zero. Therefore, a p-value of 0.00 of the Rn-squared statistics depicts strong rejection of the null hypothesis that all non-constant coefficients are equal to zero.

6.3.3 Results and Findings

To benchmark for currency crisis susceptibility, the estimated thresholds for individual WAMZ countries as well as the related averages under the two exchange markets situations are highlighted in Table 6.15 below.

Table 6.15: Exchange Market Pressure Index Thresholds

US Dollar Nominal Exchange Rates							
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***	***Average***
Threshold	3.2907	2.6959	2.2261	1.7115	4.1698	2.7095	2.8006
Nigeria Naira Nominal Exchange Rates							
	Gambia	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***	***Average***
Threshold	1.0597	1.5006	1.3268	-0.0216	na	0.3526	0.8436

Source: Author's Estimation

Table 6.16: Currency Crises Definitions with Country Specific Threshold (US Dollar Exchange Markets)

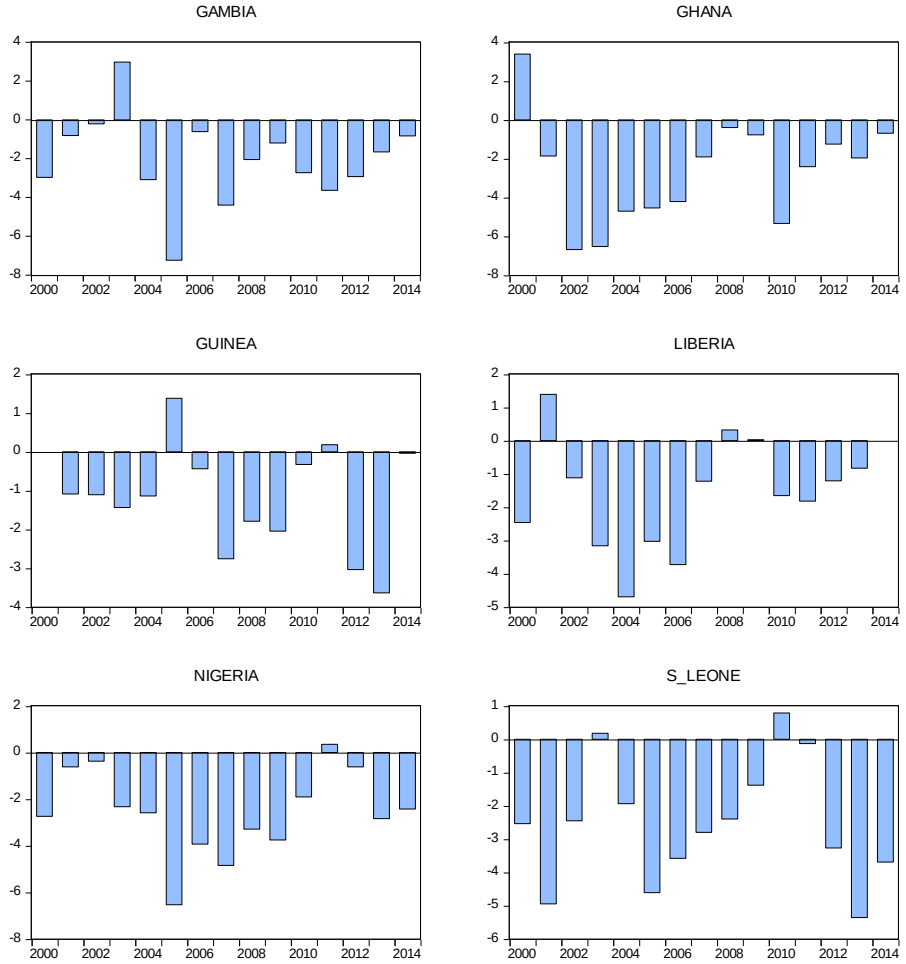
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Gambia (3.29)	0.33 (N)	2.48 (N)	3.09 (N)	6.27 (Y)	0.21 (N)	-3.94 (N)	2.68 (N)	-1.1 (N)	1.24 (N)	2.1 (N)	0.57 (N)	-0.34 (N)	0.36 (N)	1.64 (N)	2.46 (N)
Ghana (2.70)	6.09 (Y)	0.84 (N)	-3.98 (N)	-3.83 (N)	-2 (N)	-1.84 (N)	-1.51 (N)	0.79 (N)	2.3 (N)	1.93 (N)	-2.64 (N)	0.29 (N)	1.45 (N)	0.74 (N)	2.01 (N)
Guinea (2.22)	na	1.13 (N)	1.11 (N)	0.78 (N)	1.08 (N)	3.6 (Y)	1.78 (N)	-0.54 (N)	0.43 (N)	0.17 (N)	1.89 (N)	2.4 (Y)	-0.82 (N)	-1.42 (N)	2.18 (N)
Liberia (1.71)	-0.75 (N)	3.1 (Y)	0.59 (N)	-1.45 (N)	-2.99 (N)	-1.32 (N)	-2.02 (N)	0.49 (N)	2.03 (Y)	1.74 (N)	0.06 (N)	-0.11 (N)	0.5 (N)	0.88 (N)	na
Nigeria (4.17)	1.43 (N)	3.55 (N)	3.8 (N)	1.84 (N)	1.58 (N)	-2.37 (N)	0.24 (N)	-0.68 (N)	0.88 (N)	0.41 (N)	2.26 (N)	4.52 (Y)	3.55 (N)	1.33 (N)	1.74 (N)
S/Leone (2.71)	0.17 (N)	-2.24 (N)	0.26 (N)	2.89 (Y)	0.77 (N)	-1.9 (N)	-0.87 (N)	-0.09 (N)	0.31 (N)	1.33 (N)	3.5 (Y)	2.58 (N)	-0.56 (N)	-2.65 (N)	-0.98 (N)

Source: Author's estimations

Note: 'Y' denotes susceptibility to currency crisis, while 'N' means non-susceptibility to currency crisis.

For the US dollar market country-specific threshold, Table 6.16 above shows that over the period covered by this study, The Gambia (in 2003), Ghana (in 2000), and Nigeria (in 2011) were susceptible to currency crisis once while the vulnerability of Guinea (in 2005 and 2011), Liberia (in 2001 and 2008) and Sierra Leone (in 2003 and 2004) to currency crisis were twice during the period covered by this study. Figure 6.1 below shows the diagrammatic representations of the information in Table 6.16. In these charts (and subsequent related charts in this section), point zero line is the currency crisis cut-off point and the sizes of the bars indicate the magnitudes of currency crisis 'susceptibility' and 'non-susceptibility'. When bars are located above point zero, they depict periods of susceptibility to currency crisis while bar below the zero point are periods of non-susceptibility to currency crisis.

Figure 6.1: Country Specific Threshold Currency Crises Definitions (US Dollar Exchange Markets)



Source: Author's Estimation and Eviews 9.5 Output

In comparison with the scenario of the Nigerian naira bilateral exchange markets, country-specific crisis threshold, The Gambia (in 2003), Ghana (in 2000) , Guinea (in 2005) and Sierra Leone (in 2010 were susceptible once and Liberia was not vulnerable according to the information in Table 6.17 below and as reflected in Figure 6.2 below.

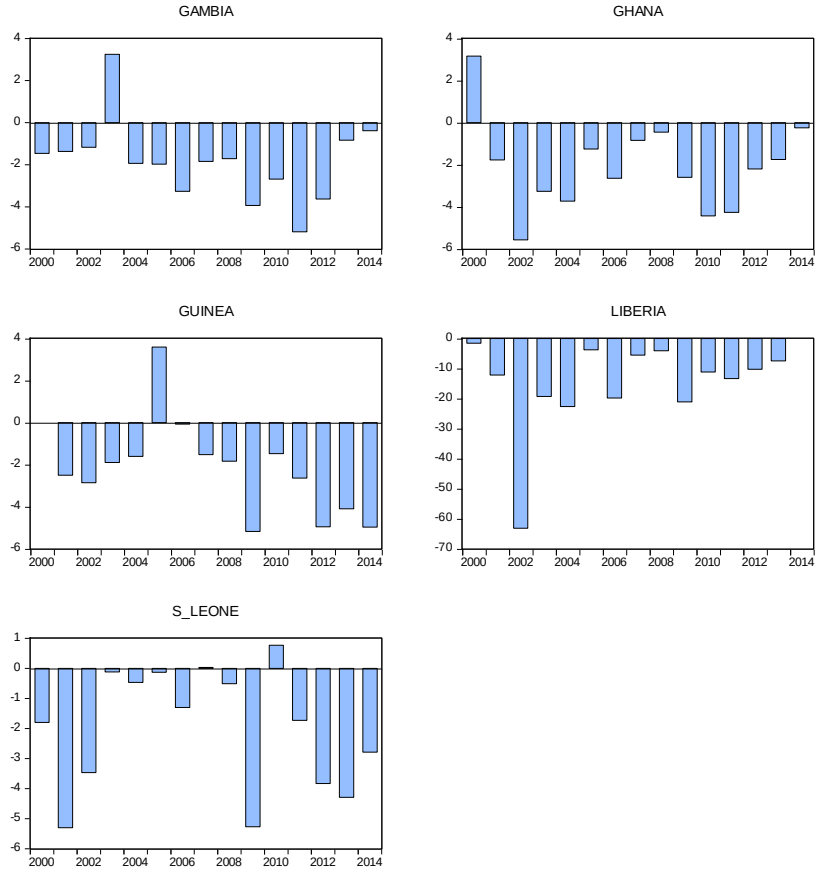
Table 6.17: Country Specific Threshold Currency Crises Definitions (Nigerian Naira Exchange Markets)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Gambia (1.06)	-0.4 (N)	-0.31 (N)	-0.1 (N)	4.31 (Y)	-0.87 (N)	-0.9 (N)	-2.2 (N)	-0.8 (N)	-0.6 (N)	-2.9 (N)	-1.62 (N)	-4.13 (N)	-2.57 (N)	0.23 (N)	0.68 (N)
Ghana (1.50)	4.66 (Y)	-0.27 (N)	-4.0 (N)	-1.8 (N)	-2.23 (N)	0.25 (N)	-1.14 (N)	0.66 (N)	1.05 (N)	-1.1 (N)	-2.93 (N)	-2.76 (N)	-0.7 (N)	-0.2 (N)	1.26 (N)
Guinea (1.33)	na	-1.17 (N)	-1.5 (N)	-0.6 (N)	-0.28 (N)	4.92 (Y)	1.26 (N)	-0.2 (N)	-0.5 (N)	-3.85 (N)	-0.15 (N)	-1.31 (N)	-3.63 (N)	-2.8 (N)	-3.6 (N)
Liberia (-0.02)	-1.6 (N)	-12.2 (N)	-63.2 (N)	-19.3 (N)	-22.6 (N)	-3.8 (N)	-19.8 (N)	-5.5 (N)	-4.1 (N)	-21.1 (N)	-11.2 (N)	-13.3 (N)	-10.2 (N)	-7.5 (N)	na
S/Leone (0.35)	-1.4 (N)	-4.95 (N)	-3.1 (N)	0.23 (N)	-0.12 (N)	0.22 (N)	-0.95 (N)	0.38 (N)	-0.2 (N)	-4.92 (N)	1.12 (Y)	-1.38 (N)	-3.48 (N)	-3.9 (N)	-2.4 (N)

Source: Author's estimations.

Note: ‘Y’ denotes non-susceptibility to currency crisis, while ‘N’ means non-susceptibility to currency crisis.

Figure 6.2: Country Specific Threshold Currency Crises Definitions (Nigerian Naira Exchange Markets)



Source: Author’s Estimation and Eviews 9.5 Output

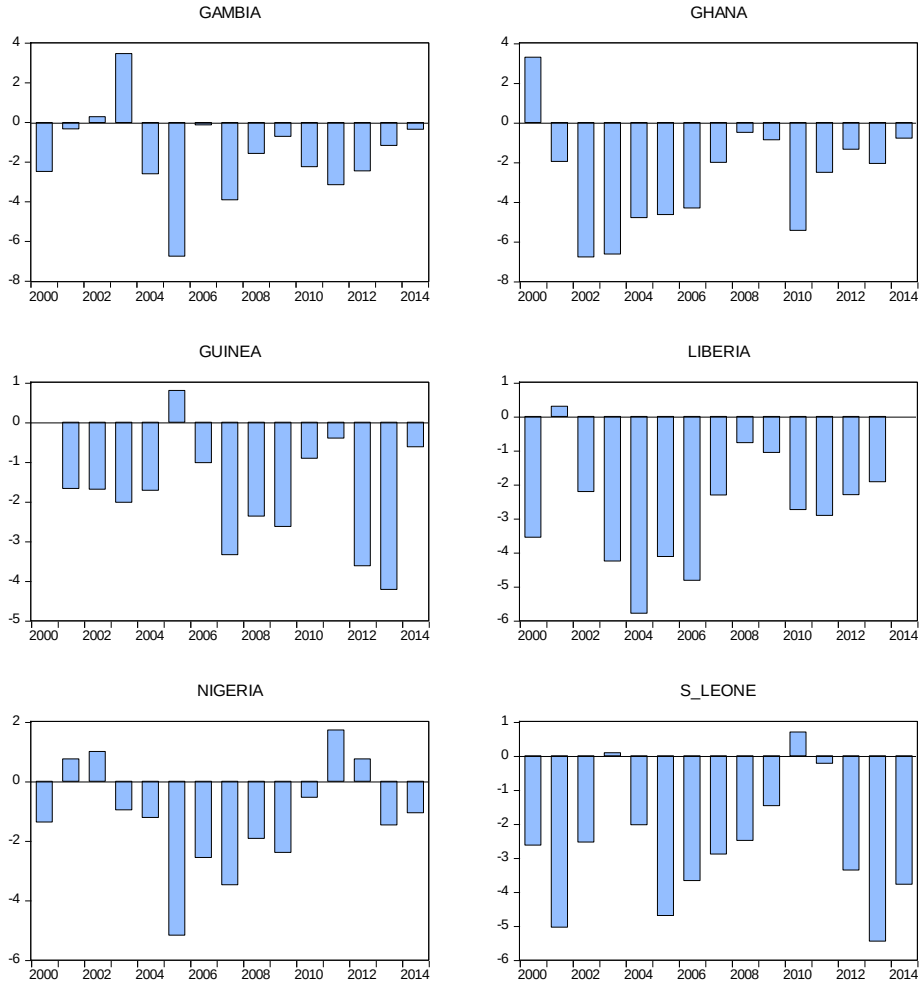
Table 6.18: WAMZ Average Threshold (2.80) Currency Crises Definitions (US Dollar Exchange Markets)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Gambia	0.33 (N)	2.48 (N)	3.09 (Y)	6.27 (Y)	0.21 (N)	-3.94 (N)	2.68 (N)	-1.1 (N)	1.24 (N)	2.1 (N)	0.57 (N)	-0.34 (N)	0.36 (N)	1.64 (N)	2.46 (N)
Ghana	6.09 (Y)	0.84 (N)	-3.98 (N)	-3.83 (N)	-2 (N)	-1.84 (N)	-1.51 (N)	0.79 (N)	2.3 (N)	1.93 (N)	-2.64 (N)	0.29 (N)	1.45 (N)	0.74 (N)	2.01 (N)
Guinea	na	1.13 (N)	1.11 (N)	0.78 (N)	1.08 (N)	3.6 (Y)	1.78 (N)	-0.54 (N)	0.43 (N)	0.17 (N)	1.89 (N)	2.4 (N)	-0.82 (N)	-1.42 (N)	2.18 (N)
Liberia	-0.75 (N)	3.1 (Y)	0.59 (N)	-1.45 (N)	-2.99 (N)	-1.32 (N)	-2.02 (N)	0.49 (N)	2.03 (N)	1.74 (N)	0.06 (N)	-0.11 (N)	0.5 (N)	0.88 (N)	na
Nigeria	1.43 (N)	3.55 (Y)	3.8 (Y)	1.84 (N)	1.58 (N)	-2.37 (N)	0.24 (N)	-0.68 (N)	0.88 (N)	0.41 (N)	2.26 (N)	4.52 (Y)	3.55 (Y)	1.33 (N)	1.74 (N)
S/Leone	0.17 (N)	-2.24 (N)	0.26 (N)	2.89 (Y)	0.77 (N)	-1.9 (N)	-0.87 (N)	-0.09 (N)	0.31 (N)	1.33 (N)	3.5 (Y)	2.58 (N)	-0.56 (N)	-2.65 (N)	-0.98 (N)

Source: Author's estimations

Note: ‘Y’ denotes non-susceptibility to currency crisis, while ‘N’ means non-susceptibility to currency crisis.

Figure 6.3: WAMZ Average Threshold (2.80) Currency Crises Definitions (US Dollar Exchange Markets)



Source: Author's Estimation and Eviews 9.5 Output

When the WAMZ average threshold of 2.80 was set in the US dollar exchange markets, Table 6.18 and Figure 6.3 above exhibit currency crisis susceptibility in all the six countries with Nigeria (in 2001, 2003, 2011 and 2012) having the highest of four years of vulnerability. The Gambia (in 2002 and 2003) and Sierra Leone (in 2003 and 2010) had two while Ghana (in 2000) and Guinea (in 2005) and Liberia (in 2001) were prone to crisis once. Nigeria, the lead foreign exchange market recorded the highest number of currency crisis vulnerability according to the WAMZ average threshold. This is a result that comes with negative implications for the exchange market integration of the WAMZ.

Table 6.19 and Figure 6.4 below give crisis information when the WAMZ average for the Nigerian naira exchange markets in which an average crisis threshold of 0.84 was set. Under

this scenario, Liberia shows no sign suggesting crisis. The Gambia (in 2003) and Sierra Leone (in 2010) had once, Ghana (in 2000, 2008 and 2014) and Guinea (in 2005 and 2006) had twice.

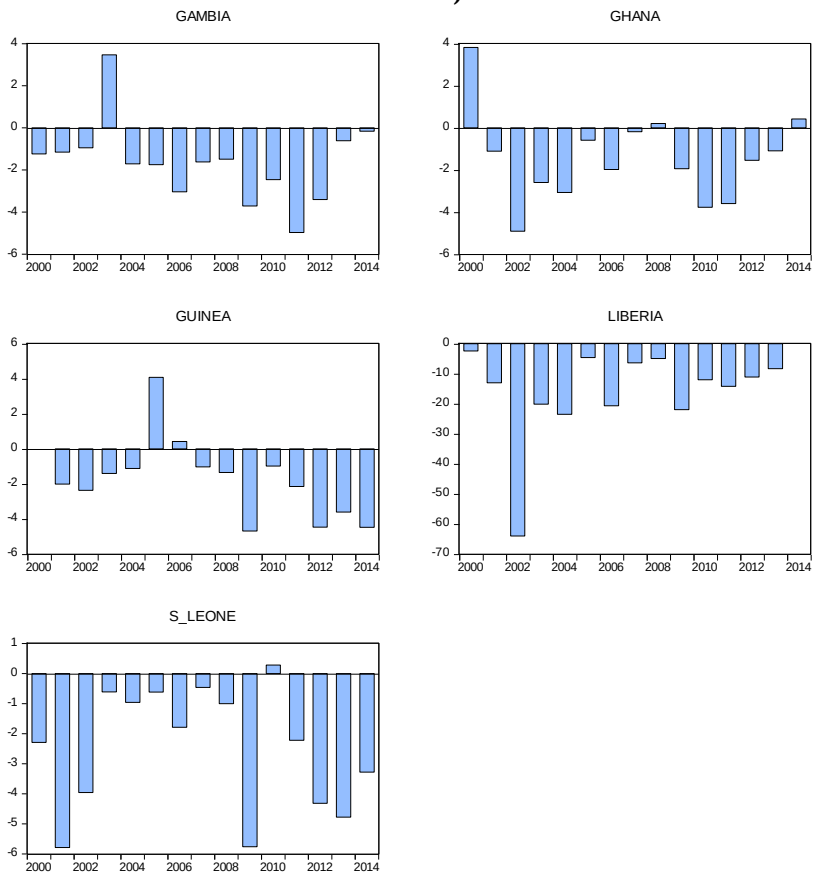
Table 6.19: WAMZ Average Threshold (0.84) Currency Crises Definitions (Nigerian Naira Exchange Markets)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Gambia	-0.4 (N)	-0.31 (N)	-0.11 (N)	4.31 (Y)	-0.87 (N)	-0.91 (N)	-2.2 (N)	-0.78 (N)	-0.65 (N)	-2.87 (N)	-1.62 (N)	-4.13 (N)	-2.57 (N)	0.23 (N)	0.68 (N)
Ghana	4.66 (Y)	-0.27 (N)	-4.07 (N)	-1.76 (N)	-2.23 (N)	0.25 (N)	-1.14 (N)	0.66 (N)	1.05 (Y)	-1.1 (N)	-2.93 (N)	-2.76 (N)	-0.7 (N)	-0.25 (N)	1.26 (Y)
Guinea	na	-1.17 (N)	-1.53 (N)	-0.57 (N)	-0.28 (N)	4.92 (Y)	1.26 (Y)	-0.19 (N)	-0.51 (N)	-3.85 (N)	-0.15 (N)	-1.31 (N)	-3.63 (N)	-2.77 (N)	-3.64 (N)
Liberia	-1.6 (N)	-12.2 (N)	-63.2 (N)	-19.3 (N)	-22.6 (N)	-3.78 (N)	-19.8 (N)	-5.54 (N)	-4.11 (N)	-21.1 (N)	-11.2 (N)	-13.3 (N)	-10.3 (N)	-7.48 (N)	na
S/Leone	-1.45 (N)	-4.95 (N)	-3.12 (N)	0.23 (N)	-0.12 (N)	0.22 (N)	-0.95 (N)	0.38 (N)	-0.16 (N)	-4.92 (N)	1.12 (Y)	-1.38 (N)	-3.48 (N)	-3.94 (N)	-2.44 (N)

Source: Author's estimations

Note: 'Y' denotes non-susceptibility to currency crisis, while 'N' means non-susceptibility to currency crisis.

Figure 6.4: WAMZ Average Threshold (0.84) Currency Crises Definitions (Nigerian Naira Exchange Markets)



Source: Author's Estimation and Eviews 9.5 Output

These currency crisis information generated with the application of the WAMZ average thresholds calculations are essential for the future single exchange rate market within the WAMZ. The size of the Nigerian economy within the WAMZ, having direct effect and influence on the size of the expected common foreign exchange market in the proposed monetary union, prompted the setting of the Nigerian currency crisis threshold of 4.17 against the EMP indices of the other five WAMZ countries; and the results of crisis vulnerability estimations for the five countries, in this context for the US dollar exchange market are shown in Table 6.20 below. In this result, only The Gambia (in 2003) and Ghana (in 2000) exhibit crisis vulnerability over the period of study.

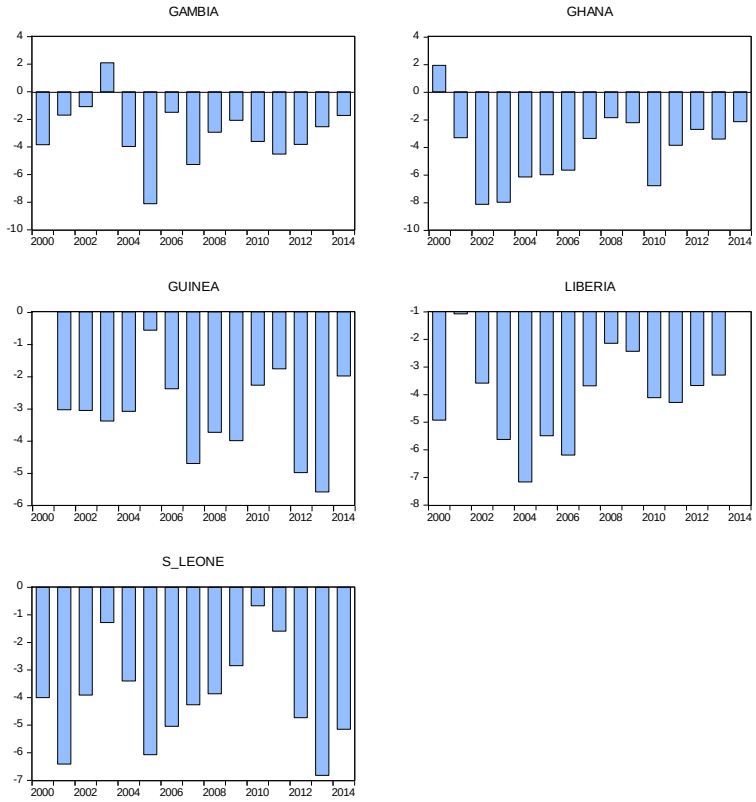
Table 6.20: Nigerian Threshold (4.17) Currency Crises Definitions
(US Dollar Exchange Markets)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Gambia	0.33 (N)	2.48 (N)	3.09 (N)	6.27 (Y)	0.21 (N)	-3.94 (N)	2.68 (N)	-1.1 (N)	1.24 (N)	2.1 (N)	0.57 (N)	-0.34 (N)	0.36 (N)	1.64 (N)	2.46 (N)
Ghana	6.09 (Y)	0.84 (N)	-3.98 (N)	-3.83 (N)	-2 (N)	-1.84 (N)	-1.51 (N)	0.79 (N)	2.3 (N)	1.93 (N)	-2.64 (N)	0.29 (N)	1.45 (N)	0.74 (N)	2.01 (N)
Guinea	na	1.13 (N)	1.11 (N)	0.78 (N)	1.08 (N)	3.6 (N)	1.78 (N)	-0.54 (N)	0.43 (N)	0.17 (N)	1.89 (N)	2.4 (N)	-0.82 (N)	-1.42 (N)	2.18 (N)
Liberia	-0.75 (N)	3.1 (N)	0.59 (N)	-1.45 (N)	-2.99 (N)	-1.32 (N)	-2.02 (N)	0.49 (N)	2.03 (N)	1.74 (N)	0.06 (N)	-0.11 (N)	0.5 (N)	0.88 (N)	na
S/Leone	0.17 (N)	-2.24 (N)	0.26 (N)	2.89 (N)	0.77 (N)	-1.9 (N)	-0.87 (N)	-0.09 (N)	0.31 (N)	1.33 (N)	3.5 (N)	2.58 (N)	-0.56 (N)	-2.65 (N)	-0.98 (N)

Source: Author's estimations
Note: 'Y' denotes non-susceptibility to currency crisis, while 'N' means non-susceptibility to currency crisis.

The implications of the results in Table 6.19 above is that if the currency market pressure in Nigeria is the core currency crisis determinant, three WAMZ countries (Guinea, Liberia and Sierra Leone) are not likely vulnerable to currency crisis, given the past trends of currency susceptibility.

Figure 6.5: Nigerian Threshold (4.17) Currency Crises Definitions (US Dollar Exchange Markets)



Source: Author's Estimation and Eviews 9.5 Output

Positive enough, Nigeria showed signs of currency crisis susceptibility just once (in 2011) in the results of the US dollar market threshold estimation in Table 6.16 above when its own threshold of 4.17 (applied for investigation yielding results in Table 6.20) is set against its EMP index. The susceptibility of the WAMZ countries in this scenario is shown graphically in Figure 6.5 above.

What the information generated under this section suggest is that the WAMZ is not currency crisis susceptible, given the low degrees of currency crisis susceptibility (of between 7% lowest and 27% highest) exhibited by the WAMZ countries over the 15-year period covered by this study. These high currency-crisis-free results portend stability in the WAMZ's future single exchange rate and single foreign exchange market.

For the estimations of the model-dependent exchange market pressure, as the first step, ADF unit root roots tests for stationarity was performed on all the data applied in this exchange market pressure evaluation at 5% level of significance as displayed in Table 6.21 below.

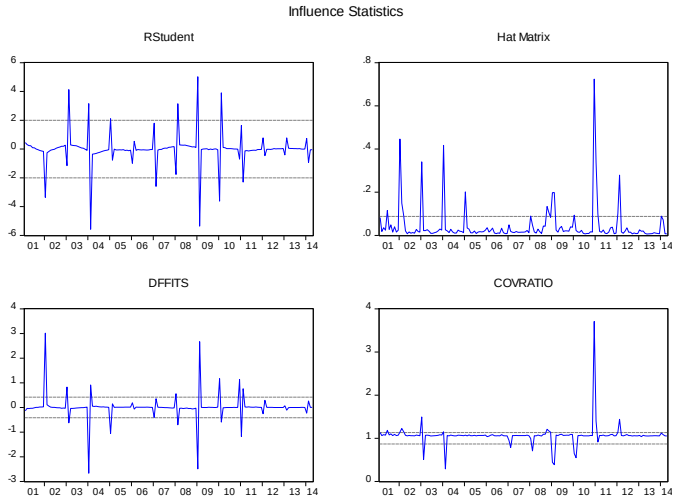
Table 6.21: Results the ADF Unit Roots Tests for the Variables of Exchange Market Pressure

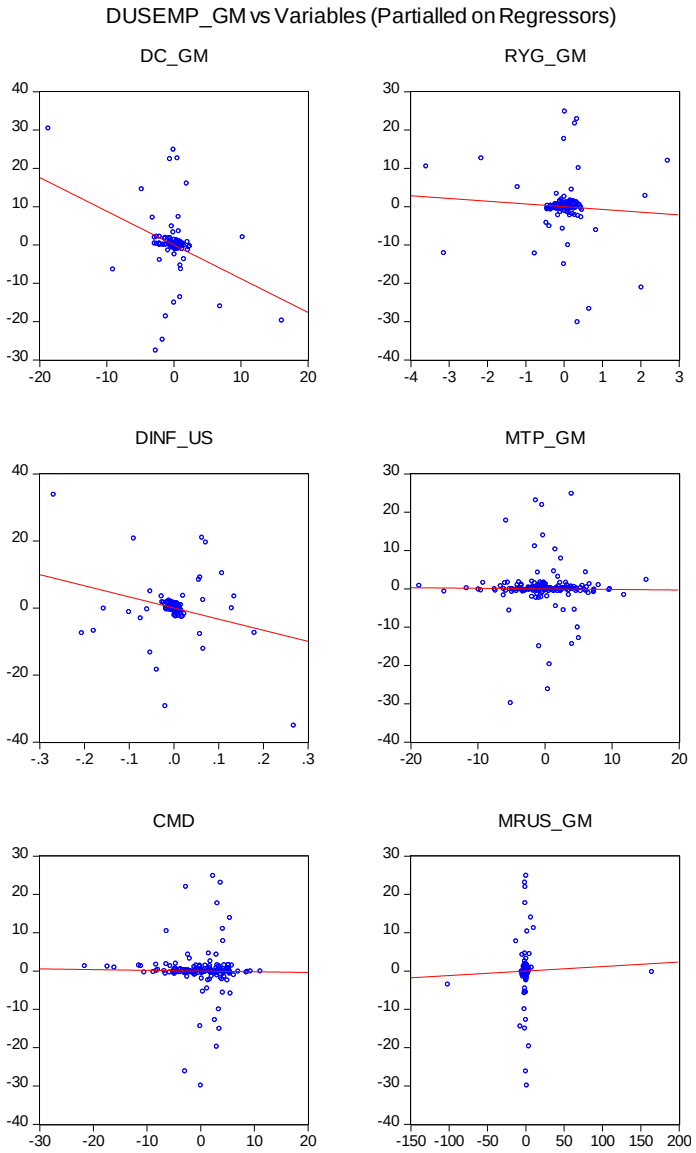
Variables	*Gambia*	*Ghana*	*Guinea*	*Liberia*	*Nigeria*	*S/Leone*
Exchange Market Pressure	-3.1214**	-3.4065*	-3.9046*	-7.6934*	-3.2906*	-4.8507*
ΔDomestic Credit/Money Base	-4.0200*	-3.5298*	-1.8202	-11.0540*	-2.9593*	-2.3718
Domestic Real GDP Growth	-5.6633*	-3.0180**	-4.9966*	-3.0330**	-4.1619*	-0.4969
ΔMoney Multiplier	-17.6505*	-15.3650*	-14.2086*	-17.6906*	-11.7025*	-13.3079*
Monetary Response Variable	-12.8013*	-13.3738*	-13.2085*	-13.1097*	-4.4156*	-13.3808*
Foreign (US) Inflation (-1.8961)						
ΔCommodity Index (-8.7045*)						
Critical values of ADF Unit Roots Test						
1%	***5%***		***10%***			
-3.9591	-3.0810		-2.6813			

Source: Author's estimations and EViews 7 Output

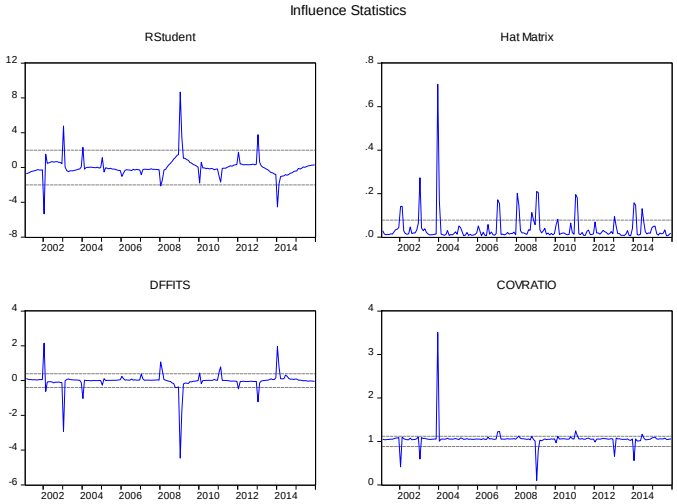
The data for foreign inflation, domestic credit/base money change for Guinea and Sierra Leone as a well as domestic real GDP growth for Sierra Leone were not stationary at levels, and were made stationary at first difference so that they can be used for regression. Every other variables employed were stationary at levels in the 'with constant' ADF unit root tests. Influence statistics and the leverage plots resulting from the OLS estimates are displayed in Figure 6.6 below.

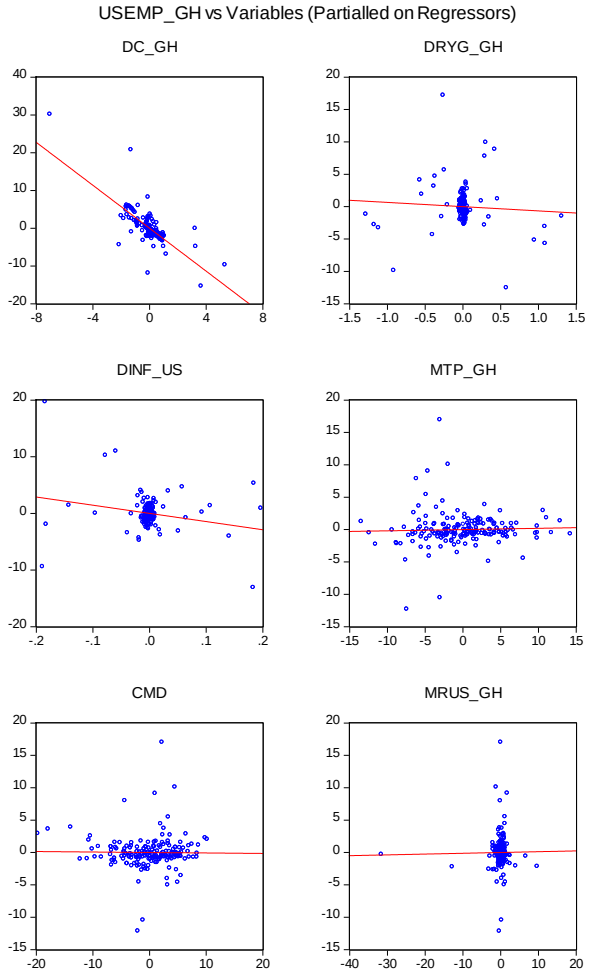
Figure 6.6: Plots of Influence Statistics and Leverage of OLS Estimations of EMP The Gambia:



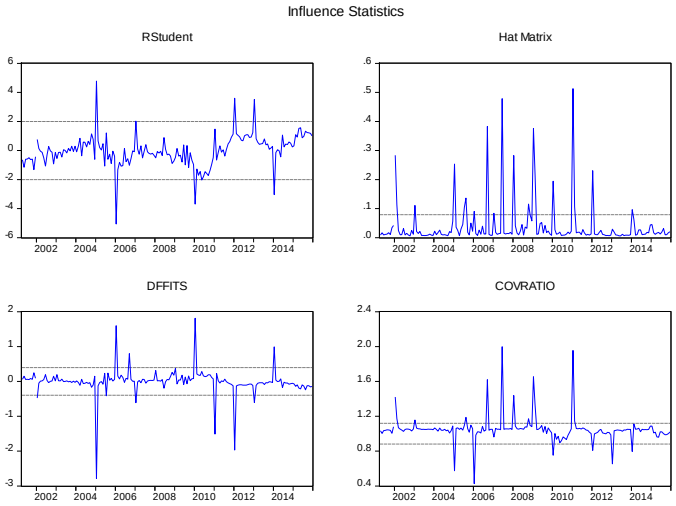


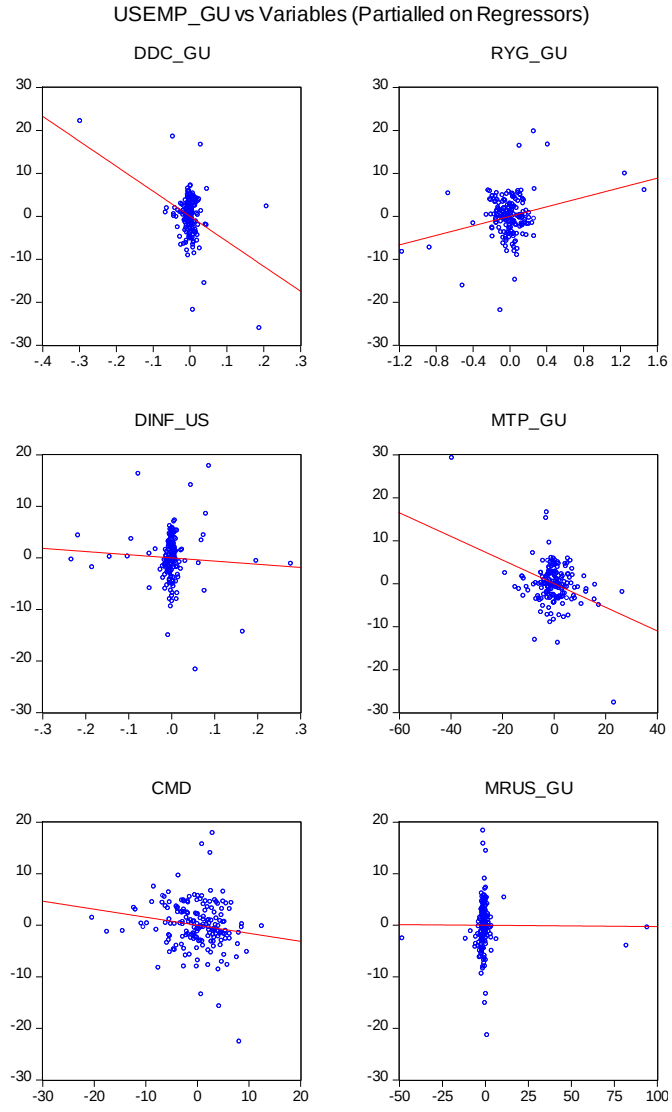
Ghana:


Influence Statistics
RStudent
Hat Matrix
DFFITS
COVRATIO

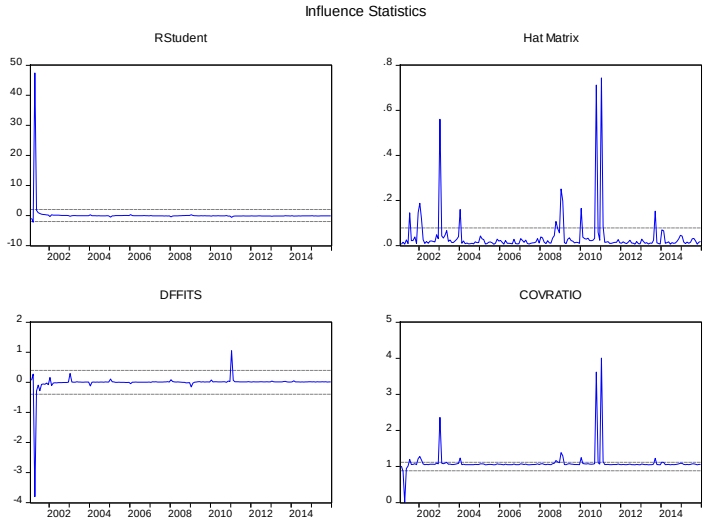

USEMP_GH vs Variables (Partialled on Regressors)
DC_GH
DRYG_GH
DINF_US
MTP_GH
CMD
MRUS_GH

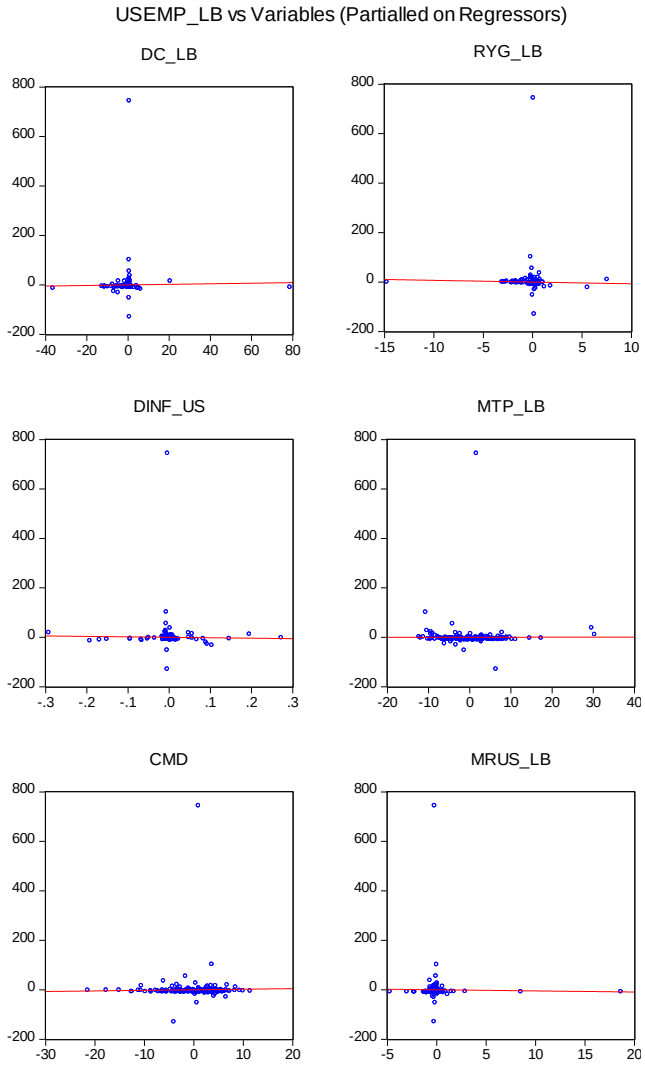
Guinea:


Influence Statistics
RStudent
Hat Matrix
DFFITS
COVRATIO

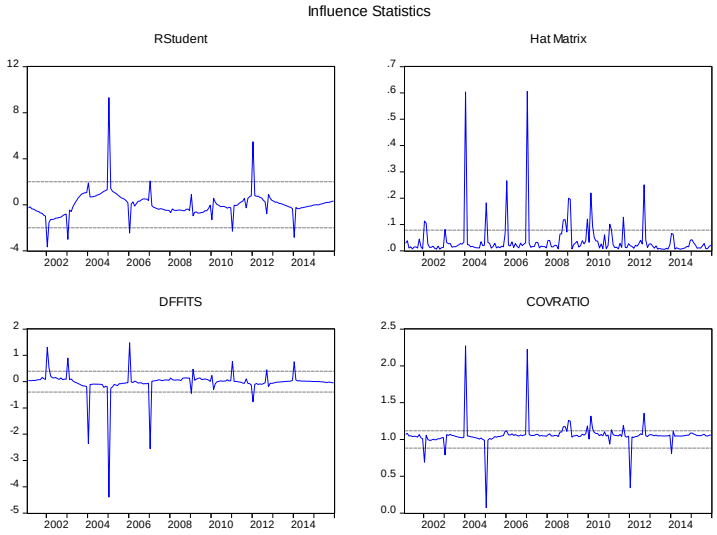

USEMP_GU vs Variables (Partialled on Regressors)
DDC_GU
RYG_GU
DINF_US
MTP_GU
CMD
MRUS_GU

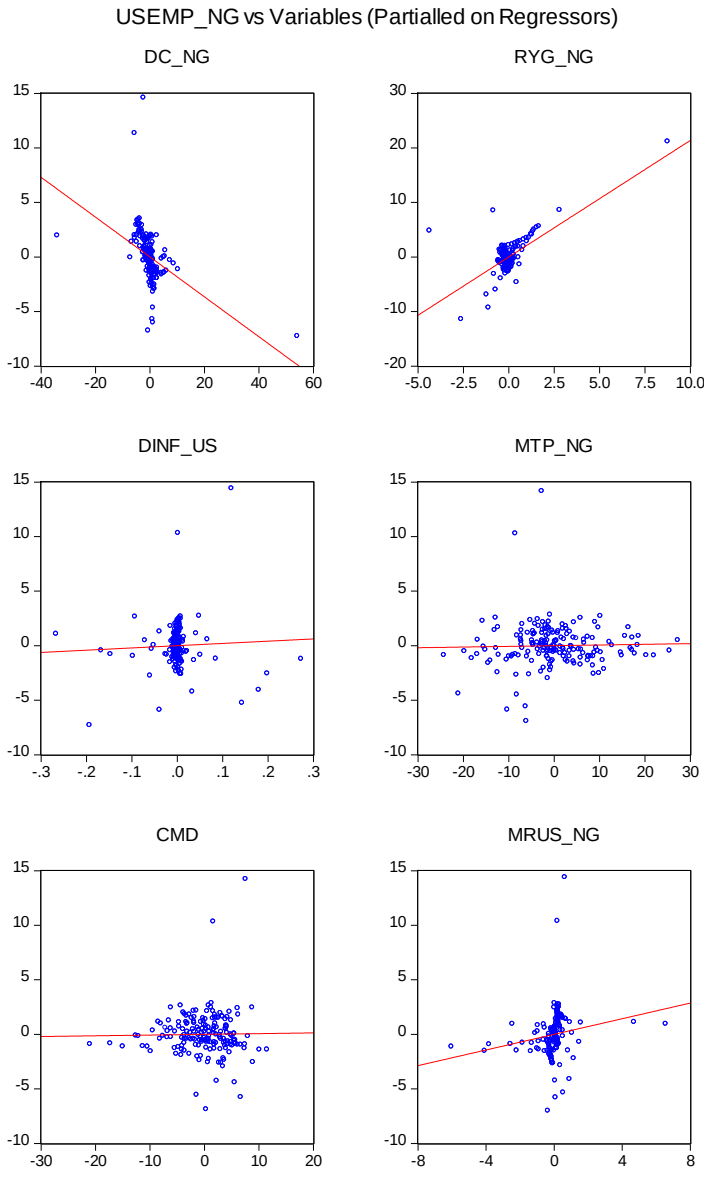
Liberia:


Influence Statistics
RStudent
Hat Matrix
DFFITS
COVRATIO

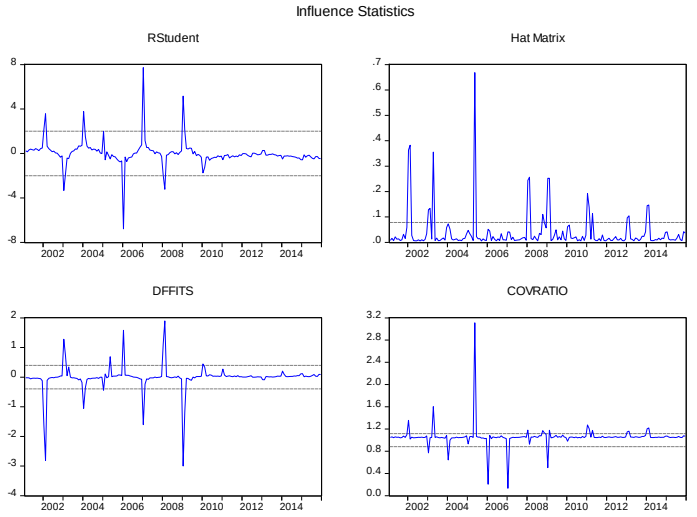

USEMP_LB vs Variables (Partialled on Regressors)
DC_LB
RYG_LB
DINF_US
MTP_LB
CMD
MRUS_LB

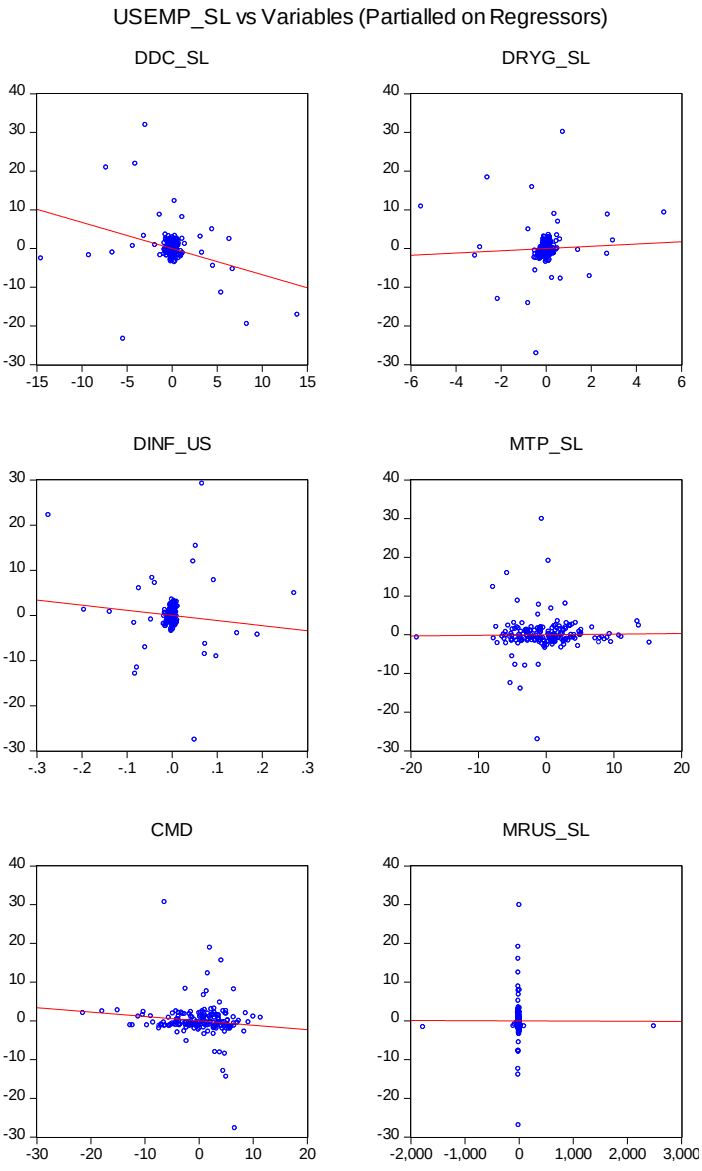
Nigeria:


Influence Statistics
RStudent
Hat Matrix
DFFITS
COVRATIO


USEMP_NG vs Variables (Partialled on Regressors)
DC_NG
RYG_NG
DINF_US
MTP_NG
CMD
MRUS_NG

Sierra Leone:





Sources: Author's Estimations and Eview 9.5 Output

The spikes in the graphs for the four measures of influence revealed a good number of outliers in the data employed in the modelling of EMP for the WAMZ countries. These were further confirmed by the various leverage plots. These provided the basis for the justification of the appropriateness of the use of the robust least square regression in this EMP evaluation. The results of the robust least square regression of the model-dependent exchange market pressure in the six WAMZ countries are exhibited below in Table 6.17, showing results from the model without the sensitivity factor of monetary responses and Table 6.18 exhibiting these sensitivity factor of monetary responses.

Table 6.22: Results of the Robust Least Square Regression Estimation of Exchange Market Pressure Model

Independent Variables	***Gambia***	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Constant	-0.0908*	-0.7621*	-1.4502*	2.8136*	-2.4704*	-0.1373*
ΔDomestic Credit/Money Base	-0.1986*	-2.570*	-69.418*	-0.0306*	-0.1730*	0.1825
Domestic Real GDP Growth	0.7012*	-0.0353	3.4222*	-1.1530*	2.6761*	0.1010*
Foreign (US) Inflation	-34.535*	10.2066*	-5.0205*	12.7280*	-6.1774*	3.0914*
ΔMoney Multiplier	0.0008	0.0347*	-0.0473*	0.0326*	0.0107*	0.0015
ΔCommodity Price Index	-0.134*	-0.0205*	0.1336*	-0.0060	-0.0266*	-0.0199*
R^2	-0.01	0.45	0.03	0.08	0.43	0.03
Rw^2	0.84	0.75	0.33	0.17	0.81	0.06
Deviance	60.65	227.25	2132.41	3726.38	324.34	559.30
Prob. (Rn-Square Statistics)	0.00	0.00	0.00	0.00	0.00	0.00
JB-Statistics (Prob.)	0.00	0.00	0.00	0.00	0.00	0.00
No. of Observations	159	177	177	179	179	179

Source: Author's Estimation and EViews9.5 Output

In the results in Table 6.22 above and Table 6.23 below, the estimations of the RLS regression show that almost all the coefficients are significant at 1% level of significance except for The Gambia's money multiplier, Ghana's and Sierra Leone's real GDP growth and commodity price index change for Liberia. In the estimation of EMP without the inclusion of the sensitivity factor, Table 6.23 reveals that for all the WAMZ countries, correct theoretical signs were reported for domestic credit growth (except for Sierra Leone), for domestic real GDP growth (except for Ghana and Liberia). For the countries with the correct signs in

domestic credit growth, these are indications that currency depreciation and depletion of reserves in these countries were caused by this factor. What the results of the domestic real GDP growth portend is that through reserve accumulation and domestic currency appreciation, this variable only influences EMP in The Gambia, Guinea, Nigeria and Sierra Leone. Foreign (US) inflation only yielded the correct theoretical sign in the cases of Ghana, Liberia and Sierra Leone indicating these as countries in which foreign inflation affects EMP. By the implication of this, foreign inflation does not affect exchange market pressures in Nigeria, the lead economy. Money multiplier produced the correct sign only for Guinea with the implication that virtually in all countries of the WAMZ (except Guinea), increase in money neither led to international reserve depletion nor domestic currency depreciation. Primary commodity index change yielded the correct sign only for Guinea, meaning that apart from Guinea, commodity price change does not increase reserves and does not cause domestic currency appreciation. This could be attributed to the global financial downturn and the downward trend in the prices of primary commodity over the period covered by this study. Explanatory powers of these coefficients are strong, particularly strongest across board in foreign inflation. For the measure of goodness-of-fit, R_w-squared (which is more appropriate for RLS regression) is high at 84% and 81% explanations of variations in the model in the cases of The Gambia and Nigeria respectively, but very poor at 6% for Sierra Leone. The p-values of 0.00 of the R_n-squared statistics reported for all the WAMZ countries indicate the strong rejection of the null hypothesis (the RLS version of Wald test) that all the non-constant estimated parameters are equal to zero, implying that all the variables employed could be included in the model. However, the p-values of the Jarque-Bera (J-B) statistics at 0.00 across all estimations points to the rejection, at 1% level of significance, of the null hypothesis of normal distribution of the residuals. Generally across the WAMZ, the results of the evaluation of the EMP (without the monetary response factor) reveal a quite good number

of similarities in the parametric responses from the estimated augmented G-R model of EMP. It is significant that the results for the lead economy in the WAMZ are all according to theoretical postulations and with high goodness-of-fit. When the sensitivity factor of monetary authority's response was introduced into the EMP model, the results in Table 6.19 below show significant coefficients (at 1% level of significance) of the variable of sensitivity factor for the WAMZ countries (except for Guinea); and positive for all the countries (except for Liberia).

Table 6.23: Results of the Robust Least Square Regression Estimation of Exchange Market Pressure Model (With Monetary Response)

Independent Variables	***Gambia***	***Ghana***	***Guinea***	***Liberia***	***Nigeria***	***S/Leone***
Constant	-0.1036*	-0.7547*	-1.4507*	2.8422*	-2.4097*	-0.1369*
ΔDomestic Credit/Money Base	-0.2014*	-2.2472*	-69.4250*	-0.03636*	-0.1720*	0.1825*
Domestic Real GDP Growth	0.7311*	-0.0517	3.4200*	-1.1595*	2.6536*	0.1010*
Foreign (US) Inflation	34.714*	10.2191*	-5.0092*	13.2776*	-5.3313*	3.0906*
ΔMoney Multiplier	0.0010	0.0362*	-0.0472*	0.03775*	0.0094*	0.0014
ΔCommodity Price Index	-0.0149*	-0.0203*	-0.1334*	-0.0042	-0.0240*	-0.0197*
Monetary Response	0.0055*	0.0185*	0.009	-0.1601*	0.2819*	0.00***
R^2	-0.00	0.45	0.03	0.09	0.44	0.03
Rw^2	0.85	0.75	0.33	0.18	0.82	0.06
Deviance	56.59	232.91	2131.38	3336.60	300.05	559.69
Prob. (Rn-Square Statistics)	0.00	0.00	0.00	0.00	0.00	0.00
JB-Statistics (Prob.)	0.00	0.00	0.00	0.00	0.00	0.00
No. of Observations	159	179	179	179	179	179

Source: Author's Estimation and EViews9.5 Output

What the significance of the variable of monetary response denote is that monetary authorities in The Gambia, Ghana, Nigeria and Sierra Leone (given the positive and significant coefficients) absorb more pressure through the depreciation of domestic currency, relative reserve depletion, while in Liberia, more market pressure were absorbed by reserve depletion, relative to currency depreciation. Monetary authority in Guinea was sensitive to none of the EMP components. One general implication here is that if Nigeria, with the strongest positive significant coefficient of the monetary authority sensitivity factor at 0.2819 going to control over 90% of the economy of the WAMZ, it is therefore of high expectation

that exchange market pressure will be absorbed more by depreciating the common currency. This is more appropriate in an exchange market integration.

6.4 Conclusions

In determining the workability and viability of a common exchange rate and a common foreign exchange market for the six WAMZ countries, this chapter evaluated the feasibility of the monetary integration of the WAMZ from two exchange rate perspectives of: (i) exchange rate determination: and (ii) exchange market pressure. The estimations of two monetary models of exchange rates (the FPMM and RIDMM) for the US *dollar* based exchange rates and the Nigerian-*naira* based exchange rates gave evidences that led to the conclusions that The Gambian *dalasi,* the Nigerian *naira* and the Sierra Leonean *leone* are the three WAMZ currencies that are well-suited for a single exchange rate regime in the proposed monetary integration. Nevertheless, when the estimations of the Nigerian *naira*-based exchange rates were performed it was evident that Sierra Leonean *leone,* the Guinea *franc* and the Ghanaian *cedi* will as well be suitable for the single foreign exchange market. What is significant here is that Nigeria (the lead economy) is evidently suited for the single exchange rate regime. While the suitability of Sierra Leone was revealed in both estimations, Liberia was not reported to be suitable in any of the estimations. The investigations of exchange markets pressures to determine the vulnerability of the WAMZ countries to possible currency crisis (given past trends) produced the evidence to suggest that the six WAMZ countries may not likely to be vulnerable to currency crisis which may mar the eventual exchange market integration. The RLS estimations of the G-R model of exchange market pressure revealed uniform parametric responses to exchange pressures across the WAMZ. It is also significant that foreign (US) inflation has no influence on exchange market pressure in the WAMZ's leading economy. However, evidences gathered revealed mixed forms of the absorption of market pressure in the WAMZ, with the majority of the member countries of the WAMZ

(including the lead economy) absorbing exchange market pressure through domestic currency depreciation relative to reserves depletion. These prompts the conclusion that in the eventual monetary union, foreign exchange market pressures are likely to be absorbed more by depreciation of the common currency rather than the depletion of reserves.

Further assessments with higher frequency quarterly data revealed the failure of the models of exchange rate to hold while the cointegration of exchange rates and the fundamentals could not be established. Although, there were some few similarities in signs and magnitude of the explanations offered by exchange rate determination fundamentals, these similarities were not strong enough. Consequently, from the results of the assessments with both annual and quarterly data it cannot be confidently inferred that a common exchange rate and a single foreign exchange market is feasible for the WAMZ countries in the proposed single currency area. The adoption of a single exchange rate in a common foreign exchange market should therefore be considered with caution. The foreign exchange market is likely to be free from future currency crisis. Because of the possible and expected massive influence of Nigeria in the foreign exchange market, foreign inflation may not hugely impact the proposed exchange rate and the external value of the proposed single currency.

Chapter 7

Summary and Conclusions

7.1 Introduction

The West African Monetary Zone (WAMZ) which comprises of the five English speaking countries of the West African sub-continent (The Gambia, Ghana, Liberia, Nigeria and Sierra Leone) and Guinea was formed by the ECOWAS in 2000 as the second monetary zone with the objective of establishing a monetary union characterised by a common central bank and a single currency which was expected to replace the existing six national currencies. The first monetary zone consists of countries within the WAEMU (UEMAO) group of the French speaking countries sharing the single currency called the CFA franc. The main purpose of establishing the WAMZ was to accelerate the economic integration process and strengthen political cooperation and achieve long term objective of establishing an economic and monetary union between all member countries of the ECOWAS. The thinking was that the successful launching of the WAMZ would aid the merger with the CFA zone to usher in the ECOWAS single currency to be called the *eco*. The WAMZ implementation programme consists of four quantitative primary convergence criteria and six secondary convergence criteria that member countries are expected to achieve. It was expected that the successful attainment of these convergence criteria would pave the way for the take-off of the monetray union and the launching the common currency of the zone. The attainment of these convergence criteria have been hard nuts to crack for the prospective members of the WAMZ as the take off date has been shifted for four times now (in 2003, 2005, 2010 and 2015). Because of inadequate preparations and lack of economic convergence among the WAMZ members, the last agreed take off scheduled for 1 January 2015 could not be attained. The

WAMZ consequently gave up the introduction of the single currency for the proposed WAMZ and took the decision to relinquish the initial plan of the WAMZ-WAEMU merger and replace this with a new plan to reschedule the creation of a single currency for the 15-member ECOWAS countries by 2020. In spite of this new arrangement, it is still consider justifiable to evaluate the monetary integration of the WAMZ, which will eventually be an integral part of the larger monetary cooperation within the ECOWAS alongside the CFA group, which is already monetarily integrated. It is against this background that this thesis specifically aimed at making assessments of the feasibility and prospects of monetary integration of the WAMZ and gather useful evidences and relevant information in drawing inference. Meeting the research aim and objectives involved the evaluation past trends in three financial and macroeconomic issues relating to the six WAMZ economies. The perspectives assesed by this research works, from which various findings were made and many conclusions drawn are: the propoerties of the OCA theory, money and monetary policy and exchange rates and exchage markets. Further efforts were made in evaluating the design of the EMU and draw out lessons for the African monetary integration initiatives in the light of the financial crisis-exposed architectural flaws of the Eurozone.

Annual, quarterly and monthly secondary data used in the study were drawn majorly from the databases of the Economist Intelligent Unit (EIU), the World Bank, the IMF, African Development Bank (AfDB), West African Monetary Institute (WAMI) and member countries' central banks and national offices of statistics. The thesis employed various appropriate statistical and econometric models, tools and estimation methods to make useful deductions. Autoregressive distributed lag regressions, Markov switching regression, ordinary least square regressions, robust least square regressions , quantile regression and the cointegrating regression methods of DOLS, CCR and FMOLS, as well as various unit root

methods were applied. Generally, most analyses undertaken in this research work spanned over the period of time between 1980 and 2015.

7.2 Summary of Main Findings of the Thesis

The main findings from this thesis are broadly classifed into four categories, each of the three major perspectives of the feasibility studies carried out in the research and of the lessons derived from the design flaws of the EMU. These findings, evidences and related conclusions are summarised in the following paragraphs:

Macroeconomic Stylised Facts and Theoretical Propositions: At the initial stage of this thesis, in order to expose some relevant and salient features of the economies of the WAMZ countries under this monetary integration assessments, considerations were given to the evaluation of the validity of some popular macroeconomic empirical stylised facts, financial regularities and theories propositions. Specifically, international parity relationships in PPP, IFE and UIP, Phillips curves and Lucas output/inflation trade-off relationships, the relationships between domestic cyclical output and some macroeconomic variables for the WAMZ countries and selected developed economies (Germany, The UK and the US), as well as some exchange rates and exchange markets regularities were assessed. There were mixed results towards giving supports or otherwise to the stylised facts and theories evaluated. Nevertheless, there were evidences to draw conclusions that co-movements of cyclical components of macroeconomic series with real output as well as the fluctuations and variability of these macroeconomic variables follow similar patterns in the developing economies (of the WAMZ) and the developed economies sampled in this study. There were evidences that the theoretical propositions and assumptions of PPP (absolute and relative), IFE and UIP all failed to hold in the WAMZ, with negative implications for the monetary models of exchange rate determination for the WAMZ economies. Virtually all the stylised facts of exchange rates and exchange market behaviours got supports from the WAMZ

countries. Over the period covered by the evaluation, characteristics and performances of the banking sectors of the WAMZ (as proxy for the zone's financial systems) revealed stability of the banking sectors of the WAMZ countries. Although, there were few similarities in signs and explanatory powers of economic fundamental, the two monetary model failed to hold in the WAMZ assessments performed with higher frequency quarterly data over the 15-year period. This failure may however, be attributed to some of the reasons given in this thesis.

OCA Theory Perspectives: The evaluation of the feasibility of the monetary integration of the WAMZ was performed from the perspectives of seven properties of the OCA theory. Estimation methods applied in these assessments were ANOVA, Theil coefficient of inequality, coefficient of variation, correlation, unit root, inflation differentials, Euclidean distance, production structure differentials, bilateral trade intensity ratios, interest rates spread, and labour rigidity ratios. Evidence gather suggested that: (i) that virtually all these macroeconomic and financial indicators failed to exhibit similar features across the WAMZ; (ii) in terms of economic dynamics of the whole WAMZ, Nigeria stands the only country that enormously share similarities with the WAMZ aggregate economy, while Ghana has same feature in a WAMZ aggregate economy, in a WAMZ without Nigeria; (iii) business cycles across the WAMZ is unsynchronised; (iv) The Gambia is the most country feasible for the exchange rate integration and fixation with the euro and the US dollars while Nigeria, the lead economy yielded unfavourable results in the inflation evaluation; (v) permanent and long-lasting effects of inflation rate and that the cost implications of disinflationary measures in a common monetary policy may be high since the future inflation may be unpredictable within the zone; (vi) there were huge similarities in production structures, particularly in the last six years of the period covered by this study, implying that the future common monetary policy will in this respect be appropriate in attending to economic disturbances in the proposed monetary zone; (vii) Liberia is the most open economy, while other countries

demonstrated close similarities in this respect. The concerns here is about the lead economy exhibiting the lowest degree of openness; (viii) The five smaller bank-based financial markets in the WAMZ (the WAMZ apart from Nigeria) have strong positive association with the Nigeria's bank-based financial system. As a factor that will determine financial development within the proposed currency area, there is lack of financial systems convergence and lack uniformity in WAMZ's central banking attitudes; (ix) Nigeria is the most labour flexible of the WAMZ countries (at a high degree of) implying (from theoretical proposition) a benefitting feature for the proposed monetary zone. Other WAMZ countries are reasonably flexible apart from Sierra Leone that exhibited a high degree of labour rigidity.

On the overall, the inference that could be drawn from the OCA perspectives is the WAMZ may not be an optimum currency area, although production structures and financial system integration assessments are positive. This is evident by the mixed results generated from the various assessments of the seven properties of the OCA and some poor results yielded by the lead economy (apart from the evidence from labour mobility and economic dynamics analyses).

Monetary Perspectives: Under the monetary perspectives assessments, money neutrality and money superneutrality, monetary reactions, monetary dominance, degree of loss of monetary independence, the suitability of common monetary policy were evaluated across the WAMZ with the application of various estimation techniques (ARDL, OLS, and dynamic Markov switching regressions). Inferences drawn from evidences gathered from these estimations led to the following suggested conclusions that: (a) due to non-neutrality and non-superneutrality of money in virtually all the WAMZ countries, a single monetary policy (with money supply as policy instrument) will suffice for the WAMZ's monetary integration in achieving future policy objectives and economic stability with the proposed monetary zone; (b) it may take long term adjustment for a single monetary policy to be suitable for all the six countries at a

time; (c) still, given the diverse forms of the nature of reactions of the monetary policy instrument to inflation and output, a single monetary policy may not be suitable for the future monetary zone; (d) there are good incidences of monetary dominance across the WAMZ. These are essentially good for monetary integration of the WAMZ; (e) The Gambia and Liberia will bear high costs of expected loss of monetary independence while the extent of this loss would be low in the cases of Ghana and Sierra Leone; (e) there will be huge influence of Nigeria over five other members of the WAMZ regarding the suitability of the proposed common currency. This thus makes Nigeria to be solely guarenteed to find the monetary integration conducive and beneficial as well as find the single monetary policy adequate for her national stability.

On the overall, conclusions from the monetary perspectives assessments are mixed. From the viewpoint of the huge size and the expected enormous influence of Nigeria (which serve as negative factor) and monetary reactions dissimilarities, the WAMZ may not likely be in a successful future monetary integration. This had been major concern in empirical literature of the assessment of the WAMZ as an optimal monetary union. However, the Ricardian equivalent stance of monetary dominance and monetary neutrality investigations both give supports in favour of the feasibility of the monetary integration of the WAMZ.

Exchange Rates Behaviours Perspectives: Assessments carried out under exchange rate perspectives here determine the feasibility exchange rate integration and a common foreign exchange market for the six WAMZ countries from standpoints of exchange rate determination, exchange market pressure and exchange rate volatility. The evidence gathered from the CCR and the DOLS regression estimations of two monetary models of exchange rates (the FPMM and RIDMM) for the US *dollar* based exchange rates and the Nigerian-*naira* based exchange rates is that The Gambian *dalasi*, the Nigerian *naira* and the Sierra Leonean *leone* are the three WAMZ currencies that are well-suited for a single exchange rate

regime in the proposed monetary integration while the evidence generated from the Nigerian *naira*-based exchange rates evaluations led to the conclusion that Sierra Leonean *leone,* the Guinea *franc* and the Ghanaian *cedi* will, as well be suitable for the single foreign exchange market. What is significant here is that Nigeria (the lead economy) is evidently suited for the single exchange rate regime. The outcomes of the random effect panel data estimations suggested that the fundamental determinants of exchange rates within the zone work well in consonance with theoretical postulations in establishing a single exchange rate for the proposed union when the largest economy within the zone is factored into the exchange rate determination. Evidences got here appear good for the operation of a single exchange rate in the WAMZ. Taking cognisance of the influence of exchange rate determination macroeconomic fundamentals, the Markov switching dynamic regressions applied to the PFMM and RIDMM models of the US dollar exchange rates display high probability of remaining within the same regime, implying infrequent switches from one regime to another. These suggest that The Gambia dalasi, the Nigerian naira and Sierra Leonean leone have transition probabilities higher than others, implying long expected durations. These however fail to hold for The Gambian dalasi in the Nigerian naira exchange rates estimations in which Sierra Leonean leone takes the lead. The conclusion here is that behaviour of exchange rates of The Gambia, the Nigeria and Sierra Leone depict that these countries are well suited for exchange rate integration of the proposed currency area under the US dollar-based exchange rates determination model. The Nigerian naira-based exchange rates regime model however revealed Sierra Leone, Guinea and Ghana as suited for the single exchange rate system. Liberia was not reported to be suitable in either of the two classes of estimations. The exchange markets pressures assessments yielded evidence to suggest that the six WAMZ countries are not likely to be vulnerable to currency crisis which may mar the eventual monetary integration. The RLS estimations of the G-R model of exchange market pressure

revealed similar parametric responses to exchange pressures across the WAMZ and that foreign (US) inflation does not impact exchange market pressure in the WAMZ's leading economy. There were varied evidences about the absorption of market pressure in the WAMZ, with the majority of the member countries (including the lead economy) absorbing exchange market pressure through domestic currency depreciation relative to reserves depletion. The consequential conclusion here is that in the eventual monetary union, foreign exchange market pressures are likely to be absorbed more by depreciation of the common currency rather than the depletion of reserves. This is a good form of uniformity.

On the overall, in consideration of both strands of evaluation exchange rate determination in the WAMZ, the adoption of a common exchange rate and a single foreign exchange market may not be viable for the WAMZ countries. Although, the single foreign exchange market is strongly likely to be free from future currency crisis. Exchange rate and the external value of the proposed single currency viz-a-viz the US dollar may not be hugely impacted by foreign inflation due to the possible massive influence of Nigeria in the foreign exchange market.

7.2.1 Eurozone Crisis Lessons for Monetary Integration of Africa

The OCA theory developed by Mundell, McKinnon and Kenen (as of then), specified all that were required for the smooth operation of a monetary union within regions that were already existing as federations (the US and Canada). The theory is silent about the necessary pre-requisites and other factors now exposed by the Eurozone crisis, some of which are: (i) the essential political requisite for proposed monetary unions; (ii) the need for a banking union to be incorporated in a monetary union; (iii) the need to see banks or banking propagating asymmetries of shocks; (iii) the need for central bank serving as 'lender of last resort' in a monetary union; (iv) the requirement of further political integration for fiscal integration. What were not anticipated by the OCA theory founding fathers, but now exposed by the EZ

crisis, offer some crucial and essential lessons for the smooth operations of proposed monetary unions within the continent of Africa. Therefore, for the monetary integration of the WAMZ, the ECOWAS, the EAC and the African monetary integration initiative at large, lessons derived from the Eurozone design flaws are as summarised in the following paragraphs:

1) ***Gradual process of monetary integration transition for Africa***: The financial crisis in the Eurozone reflects clear over-ambition in the monetary and exchange rate integration of Europe in spite of the EMU's macroeconomic divergences. This is a lesson for the African monetary integration as the continent (and its sub-regions) may suffer the after-effect and possible economic/financial crisis if sub-regional exchange rates (and monetary integration) are not gradually implemented. These require member countries' commitments and political agreements as well as monetary and fiscal coordination of member countries of the proposed monetary unions. For the purpose of the economic adjustments and flexibility, such gradual steps in monetary integration at the African sub-regions are essentially necessary with huge commitments, trusts and the willingness of proposed member countries to cooperate, defend and uphold the proposed single currency and agreed exchange rate regime. Nike Theory (the 'just-do-it' theory) and the Coronation Theory (the 'Bundesbank view') are the two schools of thoughts at the pre-Europe monetary unification and which the proponents of the African monetary cooperation should evaluate. All the same, the benefits of hindsight have flawed the former while the latter appeared to have been vindicated.[105]

[105] The 'just-do-it' theory (the Nike Theory) points to endogenous economic convergence soon after the completion of monetary integration while the 'Bundesbank view' (the Coronation Theory) is with the argument that the long convergence and political process receive the crowning achievement of a monetary union.

2) ***Asymmetric shocks are natural, inherent and in-built***: The OCA theory sees the aggregate disturbance pattern (symmetry and asymmetry) as a guiding criterion which is exogenous in deciding the participation in a monetary union. Within the Eurozone, there are the 'core' and the 'periphery' and the economic development gap between these two categories is wide. The 'periphery countries' record higher inflation rate with the consequence of lower interest rates operating across these countries if the uniform nominal interest rates operate across the Eurozone; and this would lead to destabilising asymmetric shock consequences stemming from unsustainable consumption and boom in investments in the periphery countries as witnessed during the Eurozone crisis. There were booms in the periphery countries' construction spending (in Ireland and Spain), consumption spending (in Portugal) and government spending (in Greece) due to reduced costs of borrowing. These spending booms were largely financed by large cross-border capital flows from the Eurozone's 'core' to the 'periphery' causing equally huge current account imbalances (deficits and surpluses for the 'periphery and the 'core' respectively). There was 'sudden stop' of these capital inflows in 2009/2010 due to sustainability problems and this imparted damaging and weakening asymmetric shocks within the Eurozone. These are identified problems within the Eurozone with some implications for the African 'core' and 'periphery' countries.
3) ***Need for banking union***: The Eurozone crisis has obviously revealed that banking union is required in a monetary union. Such banking union should be expected to encompass single financial rules and regulations, a single banking supervision, a well-funded single resolution mechanism for 'bad' banks and harmonised deposit insurance. These are essential whenever banks are involved in cross-border capital flows, given the destabilising effects of the inadequate supervision and regulation of a cross-border

lending policies. In the event of insolvency of banks and the absence of orderly resolution mechanism, bail-out was seen as the only alternative. This promoted moral hazards, caused bank under-capitalisation problem, negatively affected the solvency of national governments that were responsible for bank capitalisation, and increased the spirits of robotic banks and companies. If not well addressed, this problems could lead to decline confidence in banking systems, spilling beyond the specific countries. This is an issue not addressed by the OCA theory. Therefore, without banking union, African monetary union project may fail.

4) ***Instituting banking systemic fragility/instability prevention mechanism***: At the eventual launch of a monetary union (at the continent and sub-continent levels), appropriate mechanism ought to be put in place to strengthen national financial systems and thus prevent national banks from falling into crisis. One of the measure that are necessary here is the enforcement of capital requirements higher than the capital adequacy requirements prescribed the Bank for International Settlements. Apart from this, the levels of bank capitalisation should be regularly monitored and reviewed for long run stability of the banking systems as guide against banking system fragility. These are very essential for the African monetary integration project.
5) ***Forestalling fiscal extravagance and associated painful effects***: Unchecked public sector spending and fiscal recklessness/complacency (as in the case of the Eurozone's Greece) should be obviated by prospective members of the proposed African monetary unions in order to avoid possible cost of market-imposed fiscal adjustment which may be painful and unbearable. In the Eurozone, pains from the fiscal adjustments took the form of fiscal austerity measures which precluded affected member countries from offsetting the adverse impact of budget contradictions on

economic activities and employment, by applying independent monetary policy and exchange rate policy as implied by membership of the monetary union.

6) ***Detailed assessment of public finance sustainability at the pre-take-off stage of the African monetary cooperation project***: The dynamics of public debt in the Eurozone countries, more or less, witnessed stability around ten pre-crisis years. The standard equations of public debt dynamics indicates that if a country's interest rate on debt is more than the nominal GDP growth, it is necessary for such country to stabilise the debt/GDP ratio by running a sufficiently large primary budget surplus. This is a condition lacking in the case of Greece, Ireland, Portugal and Spain in the wake of the financial crisis when public debts in these countries increased. This necessitates continuous and detailed assessment of fiscal sustainability of member countries of a monetary union. This is a factor worthy of note for the monetary integration of Africa.

7) ***A debt restructuring mechanism is essential for the African monetary union project***: Automatic fiscal stabilisers can stabilise the heavily indebted countries within a monetary union if there are mechanisms for removing debt overhangs. The case of Greece in the Eurozone erupted the generalisation that heavy indebtedness is a significant obstacle to the use of automatic fiscal stabilisers around the subsequent application of market-based sovereign debt exchanges within the monetary union as basis for higher degree of stability. Because of the great scope for contagion, member countries of the Eurozone have fewer alternative means or mechanism for handling the debt crises within the union, apart from the bail-out brought about by the European Stability Mechanism (ESM).[106] This should be considered for the African monetary initiatives.

[106] It is a mechanism that should immunise sovereign from legal actions by holdouts in situations of approved debt restructuring. Debt restructuring should be set as a pre-condition when assessing lending under the mechanism in case sovereign debts go beyond the pre-agreed limit.

8) ***Envisaging possible sovereign government-banking system loop at the pre-take-off stage of the African monetary cooperation project***: There is a strong link between the sovereign and banks in the Eurozone. This was not taken into cognisance in the pre-crisis period. This is a feature of weakness that should not be ignored by member countries of the African monetary unions at all levels. Within the Eurozone, with the lack of a unified and integrated banking resolution institution and framework at the union's level, it is the responsibility of each member government to rescue its domestic banking system from collapse. A major consequence in countries with large banking system was of the risks inherent in such banking system rescue, particularly increased and apparent huge public finance deterioration for the rescuing governments in the form of banking recapitalisation and rescue packaging costs.

9) ***Avoidance of the design of problematic financial systems:*** African financial markets are broadly bank-based. Even in the face of weak and badly structured financial systems (generally lacking the existence of capital markets), African monetary unions should avoid instituting awkward and problematic financial structures at the sub-regions and the regional level of monetary cooperation. This is to avoid replica of hurting effects of the faulty designs of the Eurozone's financial system that are apparent in the contradictions in the homogeneous interbank market which happened to be characterised by dissimilar heterogeneous banking markets.

10) ***Enhanced surveillance and monitoring of regional financial markets:*** Financial crises spread like wild fire among integrated economies through financial or trade channels or a combination of the two. This justifies the institution of high-powered management of capital flows risks. Since no country within an integrated region can

detach itself from financial troubles and risks apparent in the regional environment, prevention and management of financial crisis is necessary at the monetary regional levels. This takes care of volatilities in international capital flows and serves as complement to other related global initiatives. A major lesson here is for the members of the proposed African monetary unions at the sub-regional levels to work towards enhancing the monetary region's architecture, further to the enhancement of regulatory capacities at national levels as well as financial cooperation at the international level. It is therefore essential for the regulatory authorities to focus on going beyond micro-prudential regulations and supervision of individual financial institutions and work in favour of the identification and management of inter-linkage and market-interdependent system risks. For the proposed African monetary union, this would prevent crisis-activating events (like large financial institution failure) from impairing national financial markets and the intending members' economies at large.

11) ***A normal central bank is desirable for the African monetary union project***: The common bank for a monetary union should go beyond just following monetary rules but should be conscious of performing the role of a lender of last resort, stabilising the union's payment system and banking systems supervision. The ECB has narrow scope and focus by operating less than a normal central bank. In line with the degree of independence, the extent of accountability of proposed African common central banks should be made strong. However, it is very essential that a strong political institution should be established to exert control over such common central bank.
12) ***The necessity for crisis prevention and crisis resolution mechanisms***: The inferences from the Eurozone crisis as well as the Asian financial crisis pointed to the view that it is difficult to establish and coordinate crisis resolution mechanism in the middle of

stormy economic and financial crisis. It is evident that the two monetary integrated region were totally unprepared to face the crisis and the after-effects thereof, thus pushing this huge tasks to the multilateral monetary and financial organisations at global and continental levels.[107] Because of the contagious adverse nature of financial and banking crisis and the vulnerabilities to external shocks, it is important that effective and well-functioning crisis resolution mechanism are established at the formation stages of the African monetary union in the direction of ensuring sufficient preparations for preventing financial crisis, providing prompt/swift response to crisis as well as the avoidance of unnecessary frictions during the crisis.

13) ***Proper evaluation of the costs/benefits of international financial integration within the African monetary integration plans***: The neo-classical theoretical prediction of automatic capital allocation efficiency as a propeller of international financial integration was proved wrong by the Eurozone crisis. Efficient allocation of capital as expected by the Europe's SGP was neither assured nor guaranteed, rather, unsustainable financial imbalances and bubbles were developed out of the Eurozone's unrestricted financial integration. There was under-pricing of sovereign risks in the Europe, followed by very poor debt repayment abilities of sovereign debts while much needed funds were nowhere thus leading to forced, painful overdue adjustments.[108] These were equally experienced by some developing and emerging economies in which the 'halt', 'sudden stop' and capital flows reversals were the repercussive 'capital flow bonanzas' that emanated from the period of strong unsustainable output growth. This Eurozone experience should therefore prompt the African monetary integration initiatives to properly evaluate the costs and benefits of

[107] The attempt to set up a functioning Asian Monetary Fund (AMF) failed.
[108] Volz (2013)

international financial integration within the context of proposed monetary integration of the continent in the consideration of the capital account management and international flow regulations in the determination of long term benefits and costs. Cross border activities of banks and financial institutions escalate systematic risks within a monetary union and challenges in the area of regulations. Therefore, in working towards monetary and financial integration and single markets in the African sub-regional levels, high degree of care is necessary in taking too fast financial market liberalisation at the sub-continent levels. The low level of developments in the African financial markets (particularly, the capital markets) is a point of concern at this point. Nevertheless, sound evaluation of the African monetary integration should answer the question pertaining to the extent of the integration of the financial market sectors which are beneficial in monetary integration process, having in mind the risk contagion effects of increases in international finance (as evident by the case of Greece within the Eurozone). As part of the lessons from the Eurozone crisis, proposed developments of monetary integration of the African sub-regions necessitate excellent financial architecture that would put regional cross-border financial regulatory and supervisory bodies (within a structure of supranational regulation) in place in order to guide cross-border financial flows, financial services restrictions and the liberalisation of financial regulations at the domestic national levels.

14) ***The consciousness of Africa's political and socio-cultural differences***: Unlike the successful monetary integration in the US, the Eurozone is made up of member countries having separate and different systems of government, separate law making machinery (parliament), independent and sovereign governments, different cultures and social beliefs. To work in favour of sustainability and independence, it is therefore necessary for the proposed African monetary unions to strongly address and

reduce fiscal dominance at national levels (where politicians frown at economic policy reforms) and bank dominance (in which banks might not be bothered about banking operation calamities, but rather, to enhance return on equity).

15) ***Need for strong direct link (and relationship) between inflation target and fiscal targets:*** The future African monetary union should evolve a design that would not make price stability targets to be an obsession with fiscal targets. The architecture of African monetary unions should hugely focus on price stability and inflation target through the design that would prompt the avoidance of inflation differentials among prospective members in the monetary integration and enforce adherence to long term inflation targets and fiscal targets. The size of budget balance (deficits) and public debt should be made to affect inflationary performances of the prospective members.

7.3 Statement of General Conclusions

This thesis gathered some positive evidences from the perspectives of production structures, factor market mobility, money neutrality and superneutrality, monetary dominance and exchange market pressures. Nevertheless, other differences in underlying macroeconomic variables across the WAMZ discovered from the other perspectives of OCA properties, monetary policy and exchange rate behaviour perspectives are very key and crucial in determining the feasibility of monetary integration of the zone. The huge financial, economic and monetary domination of Nigeria is a massive negative factor that should never be discarded with because of its political implications across the West African region. Given these factors (and the non-achievement of the set convergence criteria over the years), the main conclusions of the thesis is that a long-lasting and stable monetary integration of the WAMZ is not feasible.

7.4 Contributions of the Thesis to Knowledge

This study made frantic efforts in contributing to existing body of literature on monetary integration, particularly in the African context with specific emphasis on the West African sub region. Deviating sharply from what obtained in extant empirical literature on monetary cooperation, this thesis employed the novel strategy of embarking on monetary integration feasibility assessments from a wider range of perspectives of the OCA theory, money and monetary policy, exchange rate and exchange market behaviour as well as lessons taught by the Eurozone crisis. Apart from these, there were initial tests of the validity of some macroeconomic and financial stylised facts and relationships propositions and exchange rate and exchange market behaviours. Consequent upon these academic exercises embarked upon by this research work, the thesis has updated empirical literature on monetary integration. Many earlier literatures on monetary integration feasibility operated within the very limited scope of the properties of the OCA theory which incidentally were inadequate for the commencement of a monetary union as specifically evident by the Euro crisis that exposed the flaws in the design of the Eurozone. This thesis therefore took the novel initiative to broaden (as much as possible), areas and issues that were hitherto not covered in literature but which are necessarily essential for the evaluation of the viability and feasibility of a proposed monetary integration of a geographic and economic bloc. It is remarkable that this thesis, all together, brought into the investigation of monetary cooperation feasibility in Africa, the novel innovation of the application of good number of statistical and econometric analytical tools.

An innovation brought by this study is the splitting of the period of analyses under the OCA theory perspectives into two major comparative periods: (i) pre-convergence period and (ii)

the convergence period. This was considered necessary by this thesis so as to allow for the comparison of the trends of related macroeconomic variables between the period of 'normalcy' and the 'artificial' period running-up to meeting the convergence criteria. One other novel contribution to literature is the breaking down of business cycle investigation into two components of classical cycle and transitory cycle over these two periods. Equally, the analyses of inflation trends and inflation deviation in relation to the Eurozone and the US monetary blocs (and the various estimated averages in this respect) within these two period are innovative contributions to monetary integration literature. It is a novel effort that this study restricted the evaluation of financial system homogeneity based solely on banking system factors, due to the reality that WAMZ developing economies are grossly bank-based. The introduction of money neutrality and monetary dominance issues into an African monetary integration feasibility evaluation are pivotal contributions given the role expected of the single currency within the entire future African single currency bloc. The inference from this study is that the single currency, very likely, will play a crucial role in influencing real macroeconomic variables across the WAMZ. This work deviated from the use of the Taylor rule to examine monetary reactions, monetary independence and monetary policy suitability by appropriately employing the use of a variant of the hybrid McCallum Taylor rule model and McCallum monetary rule in which money supply growth serve as the responding variable of monetary policy instrument in related econometric/statistical analyses as well as the statistical estimations of monetary policy suitability index. The deviation from the application of policy interest rate (as monetary policy instrument) in this respect was motivated by the comparative reality of macroeconomic impact of money supply growth over interest rate in developing economies. Contributions made in this regard (of McCallum money growth rule) therefore portend developing economy realities and implications in the direction of establishing the homogeneity of monetary reactions, expected degree of loss of

monetary independence and the suitability of common currency in the WAMZ as a future monetary union. This research work added values to the existing body of knowledge in pre-monetary integration analyses by incorporating exchange rate and exchange market behaviours into such study. A novel contribution here is the information provided by the behaviour of the underlying macroeconomic factors of exchange rate determination in the WAMZ, under the two monetary models of exchange rates determination, augmented with the influence of country-specific primary commodity price, under two exchange rate quotation systems. The application of dynamic cointegrating methods of CCR and DOLS and Markov switching regression provide the needed knowledge in this aspect of the research study which introduced dynamic modelling into exchange rate determination study of the WAMZ, due to the sluggish nature of responses of macroeconomic and financial variables in developing economies. This thesis constructed or estimated monetary policy suitability index for the six countries (employing money supply growth as policy instrument). The knowledge provided here are statistical proof and evidence of the dominance of the future common monetary policy of the WAMZ by Nigeria as the research work here revealed 'statistically' that the future single monetary policy would be most suitable for Nigeria for her national stability, given the revealed ranking of the six WAMZ countries as pointed out by the monetary policy suitability indicators (MPSI) generated by the analysis and the crucial comparative distance gap between the MPSI for Nigeria and those of other five WAMZ countries.

The evaluation of exchange rate behaviours in the WAMZ, based on bilateral exchange rate relationships between the WAMZ countries is an innovation in monetary integration assessment literature. Further comprehensive information on exchange market behaviour was provided and new knowledge added on currency crisis susceptibility of foreign exchange markets in the WAMZ to currency crisis, within the context of two exchange rate quotation

markets (the US dollar and the Nigerian naira exchange market). The analysis of exchange market pressure and exchange market currency crisis susceptibility involving the rate of a possible anchor country of a proposed monetary union viz-a-viz other members of the proposed union is novel in monetary integration evaluation literature on Africa. This thesis specifically provided comprehensive knowledge on the degree and possibility of currency crisis (a component of financial crisis) crippling the monetary integration of the WAMZ from the view-point of: (a) WAMZ country-specific threshold (US dollars exchange markets); (b) WAMZ country-specific threshold (Nigerian naira exchange markets); (c) WAMZ average threshold (US dollars exchange markets); (d) WAMZ average threshold (Nigerian naira exchange markets); and (e) Nigeria currency crisis threshold. Further knowledge on exchange rate and exchange market behaviour were yielded on the largest foreign exchange market in the WAMZ (the Nigerian market) which may likely determine the trend and bulk of operations within the WAMZ's future consolidated exchange rate market. Knowledge were added about the volatility of exchange rate return and the speed of reaction to shocks within the market in the determination of the influence of external shocks of exchange rate volatilities. This study is of the view that the nature of the Nigerian foreign exchange market would greatly reflect the overall expected feature of the WAMZ's integrated foreign exchange market.

Crucial lessons (which are hugely essential for the formation and stability of the African monetary union) were equally spelt out by this thesis. These are lessons derived from the Eurozone crisis. The compendium of issues and information provided in this particular area of study is in the form of a bulk of the necessary and valuable knowledge that would put the future African monetary unions on solid foundation and sound footing.

For the academia, further knowledge added is that studies on monetary integration feasibility could be expansive (beyond the OCA theoretical underpinnings) and be more all-

encompassing to cover wider areas and issues which prevailing economic and financial issues could prompt. The application of many other tools of analysis that works with realities would work all together in achieving this goal.

Consequent upon the findings and contributions that this thesis has made to the existing body of knowledge, I here recommend that issues and findings generated by this thesis to the academics as well as the appropriate national and regional authorities within the West African Monetary Zone (WAMZ), the wider ECOWAS monetary integration and beyond, for necessary decision making and actions.

7.5 Implications of the Study for Policy

Findings of this thesis and discussions thereof have significant policy implications both at national and regional levels in the WAMZ, the wider ECOWAS, Africa and beyond. The academic exercises performed in this research work have offered up-to-date relevant information to international financial and economic policy makers at these levels. Expositions on money and monetary and fiscal policies related issues, business cycles shocks and inflation trends, financial systems convergence, labour mobility, economic dynamics, exchange rate determination and exchange market behavioural reflections of currency crisis susceptibility and convergence criteria achievement ratings and others, pass on valuable information which are all together necessary for policy decision making and actions as well as overall improvement.

Specifically, for the ECOWAS monetary integration project, policymakers at the West African Monetary Institute (WAMI), the common central bank for the WAEMU as well as the WAMZ's bodies of central bank Governors and Ministers of Finance and other institutions responsible for decision making and action on the take-off of the ECOWAS monetary integration, results and findings generated by this thesis would inform decisions about continuing membership of the WAMZ, and subsequent of the expanded ECOWAS

monetary union expected to take off by 2020 as well as the African monetary union and single currency scheduled for take-off in 2023.

References

Abudu, M (2003), "Challenges to the Introduction of the Eco in the West African Monetary Zone: A Prognosis", *West African Journal of Economic and Monetary Integration* Accra, Vol 3. No 2.

Abu-Qarn, A. and Abu-Bader, S. (2008). 'On the Optimality of GCC Monetary Union: Structural VAR, Common Trends and Common Cycles Evidence'. *The World Economy*, Vol. 31(5), pp. 612-630.

Acaravci, S. K and Acaravci (2007). 'Purchasing Power Parity under the Current Float, International Research', *Journal of Finance and Economics*, Vol. 10, pp. 1450-2887.

Adjaute, K. and J. P. Danthine (2003). 'European Financial Integration and Equity Returns: A Theory Based Assessment' in "*The Transformation of the European Financial System'*, Gaspar, Hartmann and Sleijpen (eds), European Central Bank.

Afat, D.; Gomez-Puig, M.; Sosvilla-Rivero, S. (2015). 'The Failure of the Monetary Model of Exchange Rate Determination'. *Applied Economics*, Vol. 47 (43), pp. 4607-4629.

Agbeyegbe, T. D., (2009). 'On the Feasibility of a Monetary Union in the Southern Africa Development Community'. *International Journal of Finance and Economics*, 13(2), pp.150-157

Ahn C., Kim H. B. and Chang D. (2006). Is East Asia fit for an Optimum Currency Area? An Assessment of the Economic Feasibility of a Higher Degree of Monetary Cooperation in East Asia. *Development Economics*, Vol. 44 (3), pp 288– 305.

Alagidede, P. and Tweneboah, G. (2015). 'Convergence of Growth Rates in the West African Monetary Zone.' *Journal of Economic Cooperation and Development*, Vol. 36(4), pp.29-54.

Alagidede, P., Coleman, S. and Cuestas, J.C. (2012). 'Inflationary Shocks and Common Economic Trends: Implications for West African Monetary Union Membership'. Journal of Policy *Modelling* Vol. 34(3) pp460– 475.

Alesina A, Barro, R and Tenreyro, S (2002) "Optimum Currency Areas" *NBER Working Paper* No 9072, June

Alshehry, A. S. and Slimane, S. B. (2013). 'On the Optimality of GCC Monetary Union: Asymmetric Shocks Assessments'. Review of Economics and Finance, Vol 3, pp. 49-62.

Alvarado, S. (2014). 'Analysis of the Optimum Currency Area for ASEAN and ASEAN+3'. *Journal of US-China Public Administration*, Vol. 11 (12) pp. 995-1004.

Angeloni, I. A, Kashyap, A., Mojon, B and Terlizzesse, D. (2011) Monetary Transmission in the Euro Area: Where Do We Stand?" *ECB Working Paper* No114

Ardeni, P. G. and Lubian, D. (1991). 'Is there trend Reversion in Purchasing Power Parity?' *European Economic Review*, Vol. 35 (5), pp. 1035-55.

Aron, J. and Ayogu, M. (1997). 'Foreign Exchange Market Efficiency Tests in Sub-Saharan Africa. *Journal of African Economies (AERC Supplement),* Vol. 6(E3), pp. 150-192.

Asongu, S. A. (2015).'A Literature Survey on Proposed African Monetary Unions' MPRA Paper No. 70234.

Asongu, S. A., (2013a). 'Real and Monetary Policy Convergence: EMU Crisis to the CFA Zone'. *Journal of Financial Economic Policy*, 5(1), pp. 20-38.

Asongu, S.A. (2013). 'A Short-run Schumpeterian Trip to Embryonic African Monetary Zones'. Vol. 3(1) pp859–873.

Asongu, S.A. (2014a). 'REER Imbalances and Macroeconomic Adjustments in the Proposed West African Monetary Union'. *South African Journal of Economics* Vol. 82(2) pp276–289.

Asongu, S.A. (2014b). 'Are Proposed African Monetary Unions Optimal Currency Areas? Real, Monetary and Fiscal Policy Convergence Analysis'. *African Journal of Economics and Management Studies* Vol. 5(1) pp9–29.

Asongu, S.A. (2014c). 'How would Monetary Policy Matter in the Proposed African Monetary Unions?' Evidence from Output and Prices. *African Finance Journal* Vol. 16(2) pp34–63.

Augustine, C. (2008). 'The Synchronisation of Business Cycles in CARICOM: Is there a Case for a Caribbean Monetary Union?' *International Journal of Development Issues*, Vol. 7 (1), pp 29-40.

Augustine, C. and Huntek, K. (2008). 'A Monetary Union for Selected Caribbean Country: Empirical Evidence based on Time Varying Parameter'. *Savings and Development*, Vol. 32 (2), pp. 175-190.

Bacha, O. I. (2008). 'A Common Currency Area for ASEAN? Issues and Feasibility'. *Applied Economics*, Vol. 40(4), pp. 515–529.

Baele, L., A. Ferrando, P. Hordahl, E. Krylova and C. Monnet, 2004, "Measuring Financial Integration in the Euro Area," *Oxford Review of Economic Policy* 20(4): 509-530.

Bakoup, F. and Ndoye, D. (2016). 'Why and When to Introduce a Single Currency in ECOWAS' *Africa Economic Brief*, Vol. 7 (1).

Baldwin, R. and Wyplosz C. (2012). 'Economics of European Integration, 3rd Edition'. London: McGraw Hill Education.

Balogun, E.D. (2007) "Monetary Policy and Economic Performance of West African Monetary Zones Countries", *Munich Personal RePEC Archive* (MPRS) Paper No 4308.

Balogun, E.D. (2009). Inflation Differential in the West African Monetary Zone (WAMZ) Area: Implications for Unionization MPRA Paper No. 13045,

Bangake, C. (2008). 'Exchange Rate Volatility and Optimum Currency Area: Evidence from Africa'. *Economics Bulletin* Vol. 6(12) pp1–10.

Barro, R. J and Gordon, D. B. (1983). 'Rules, Discretion and Reputation in a Model of Monetary Policy'. NBER Working Paper No. 1079

Bayoumi T, and Eichengreen, B. (1994). 'One Money or Many? Analysing the Prospects for Monetary Unification in various Parts of the World'. *Princeton Studies in International Finance,* No. 76.

Bayoumi T, Mauro P (2001). The Suitability of ASEAN for a Regional Currency Arrangement. *World Economy*, Vo. 24(7), pp. 933–954.

Bayoumi, T. and Eichengreen, B. (1993). 'Shocking Aspects of European Monetary Integration', in F Torres and F Giavazzi (eds) *Adjustment and Growth in the European Monetary Union*, London: CEPR, Cambridge University Press.

Bayoumi, T. and Eichengreen, B. (1996), "Ever Close to Heaven? An Optimum Currency Area Index for European Countries", *European Economic Review* 41, 761-770.

Bayoumi, T. and Ostry, J. (1997). 'Macroeconomic Shocks and Trade Flows within Sub-Saharan Africa: Implications for Optimum Currency Arrangements'. *Journal of African Economies* Vol. 6(3) pp412–444.

Bean, C.R. (1992), "Economic and Monetary Union in Europe", Journal *of Economic Perspectives* Vol 6, No 4 Fall 1992 pp 31-52.

Beck, G. W. and Wieland, V. (2008). 'Central Bank Misperceptions and the Role of Money in Interest Rate Rules'. *ECB Working Paper No. 967*.

Beck, T. and R. Cull (2013). 'Banking in Africa'. *CSAE Working Paper* WPS/2013-16.

Benassy-Quere, A. and Coupet, M. (2005). 'On the Adequacy of Monetary Arrangements in Sub-Saharan Africa'. *The World Economy* Vol. 28(3) pp349–373.

Benbouziane, M. and Benamar, A. (2010). 'Could GCC Countries Achieve an Optimal Currency Area?' *Middle East Development Journal*, Vol. 2 (2), pp 203-227.

Benjamin, N. Golub, S. and Mbaye, A. A. (2015). 'Informality, Trade Policies and Smuggling in West Africa*.' Journal of Borderlands Studies,* Vol. 30(3) pp. 381-394.

Bilson, J. (1978). The Monetary Approach to the Exchange Rate: Some Empirical Evidence. IMF Economic Review (1978) Vol. 25: (1) pp 48-75.

Blanchard, O. and J. Wolfers (2000). 'The Role of Shocks and Institutions in the Rise of European Unemployment: The Aggregate Evidence'. *The Economic Journal*, Vol. 110, pp. C1-C33.

Bohn, H. (1998), 'The Behaviour of US Public Debt and Deficits', *Quarterly Journal of Economics* 113(3), 949–963.

Boone, J. (2008). 'A new way to measure competition', *Economic Journal*, Vol. 118, pp. 1245 -1261.

Bordo M. and Jonung, L. (1999). 'The Future of EMU: What does the History of Monetary Unions Tell Us?' *NBER Working Papers*, No. 7365.

Boyd, J. H. and G. DeNicolo (2005). 'The Theory of Bank Risk Taking and Competition Revisited'. *Journal of Finance*, 60 pp.1329-1345.

Boyer, R.S. (2009) "Reflections on Milton Friedman's Contributions to Open Economy Money/Macro", Journal *of Internal Money and Finance* pp.1097-1116

Braithwaite, S. (2017). 'What do Demand and Supply Shocks say About Caribbean Monetary Integration?' *The World Economy*, Vol. 40 (5), pp. 949-962.

Buigut, S. and Valev, N.T. (2009). 'Benefits from Mutual Restraint in a Multilateral Monetary Union'. *World Development* Vol. 37(3) pp585–594.

Buiter, W. H. (2008). Economic, Political and Institutional Prerequisites for Monetary Union among the Members of the Gulf Cooperation Council'. *Open Economies Review*, Vol. 19 (5), pp. 579-612.

Calvert, L.E., Fisher, J.A. and Thompson, S.B, (2006). 'Volatility Co-movement: A Multi-frequency Approach', *Journal of Econometrics*, 131, 197-215.

Calvo, G (1988). 'Servicing the Public Debt: The Role of Expectations, *American Economic Review*, 78(4): 647- 661.

Calvo, G. A. and Reinhart, C. M. (2002). 'Fear of Floating'. Quarterly Journal of Economics, Vol. 107, pp 379-408.

Carlin, W. and D. Soskice (2015). '*Macroeconomics: Institutions, Instability and Financial System'*. New York: Oxford University Press.

Carney, D. (1961), "*Government and Economy in British West Africa*", New York: Bookman Associate.

Carter, M. (1983). 'Issues in the Hidden Economy: A Survey'. *Economic Record*, Vol. 60 (3) pp. 209–221.

Celasun, O. and Justiniano, A. (2005). 'Synchronization of output fluctuations in West Africa: Implications for Monetary Unification'. *IMF Working Paper*, Washington.

Cham T. (2009). "Is WAMZ an Optimum Currency Area*", West African Journal of Monetary and Economic Integration* Vol. 9, No2, pp.89-113.

Chuku, A. (2012). 'The proposed *eco*: Should West Africa proceed with a Common Currency? Centre for the Study of African Economies (CSAE); *Conference on Economic Development in Africa*'. Oxford University, Oxford, 18–20 March.

Clark, P.K. (1973) 'A Subordinated Stochastic Process Model with Finite Variance for Speculative Prices',Econometrica 41, 135-155.

Cochrane, J. H. (2007). 'Determinacy and Identification with Taylor Rules'. *NBER Working Paper 13410.*

Cohen, B. (1993). 'Beyond EMU: The Problem of Sustainability' *Economics and Politics*, Vol. 5(2), pp. 187-203.

Coleman, S. (2011). 'Investigating Business Cycles Synchronisation in West Africa'. *Discussion Paper in Economics* 2010/11, Nottingham Trent University.

Colley, L. P. (2015). 'Gravity to CARICOM: An Analysis of CARICOM External Trade Using and Augmented Gravity Model'. *Journal of Economics, Business and Management*, Vol 3 (12).

Colombatto, E. (2000). 'The Crisis of Europe's Centralised Federation: Ambiguities of a harmonised Currency Union.' *The Independent Review*, Vol. 14(4), pp. 533-553.

Corden, W. (1972), "Monetary Integration Essays in International Finance" *International Finance* No 93 Princeton University.

Corsetti, G and Pesenti, P. (2002). 'Self-Validating Optimum Currency Areas' NBER Working Paper No. 8783.

Coulibaly, I. and Gnimassoun, B. (2013). 'Optimality of a Monetary Union: New Evidence from Exchange Rate Misalignments in West Africa. Economic'. *Modelling* Vol. 32(May) pp463–482.

Cuesta, J. C. and Dobson, C. R. (2013). 'Convergence of Inflationary Shocks: Evidences from the Caribbean'. *The World Economy*, Vol. 36 (9), pp. 1229-1243.

Culver, S. and Papell, D. (1999). 'Long-Run Purchasing Power Parity with Short Run Data: Evidence with a Null Hypothesis of Stationarity', Journal of International Money and Finance, Vol. 18, pp. 751–768.

Davig, T., and E. M. Leeper (2005): "Monetary Policy-Fiscal Policy and Fiscal Stimulus. NBER Paper No. 15133.

Davoodi, H.R., Dixit, S., and Pinter, G. (2013). 'Monetary Transmission Mechanism in the East African Community: An Empirical Investigation'. *IMF Working Paper* No. 13/39, Washington.

de Bandt, O. and Mongelli, F. P. (2000). 'Convergence of Fiscal Policies in the Euro Area' *ECB Working Paper* No. 20. May 2000.

De Grauwe P., and Mongelli F. (2005) "Endogeneities of Optimum Currency Areas: What brings Countries sharing a Single Currency Close Together", *European Central Bank Working Paper* No 468.

De Grauwe, P (2005), "*The Economics of Monetary Union*" 6th Edition Oxford: Oxford University Press.

De Grauwe, P, (2015) 'Design Failures of the Eurozone'. *VoxEU.org*, 7 September. https://voxeu.org/article/design-failures-eurozone

De Grauwe, P. (1992). '*The Economics of Monetary Integration*.' Oxford and New York: Oxford University Press.

De Grauwe, P. (2006). 'What have we Learnt about Monetary Integration since Maastricht Treaty?' *Journal of Common Market Studies*, Vol. 44(4), pp. 711-730.

De Grauwe, P. (2010). 'A Mechanism of Self-destruction of the Eurozone' *CEPS Commentary*, 9 November.

De Grauwe, P. (2012). '*Economics of Monetary Economics'*. Oxford: Oxford University Press.

De Grauwe, P. (2012). 'The Governance of a Fragile Eurozone.' *Australian Economic Review*, Vol. 45(3), pp. 255-68.

De Grauwe, P. (2013). 'Design Failures in the Eurozone: Can they be fixed?' *European Economy Economic Papers*, No.491.

De Grauwe, P. (2014). '*The Economics of Monetary Integration*.' Oxford and New York: Oxford University Press.

De Grauwe, P. and Ji, Y. (2013). 'From Panic-driven austerity to symmetric macroeconomic policies in the Eurozone', *Journal of Common Market Studies*, Vol. 51(S1) pp. 31–41.

De Grauwe, P., 1992. '*The Economies of Monetary Integration'*. Oxford: Oxford University Press.

de la Dehesa, G, and Krugman, P. R. (1992). "EMU and the Regions.' Group of Thirty Occasional Paper 39, Washington, DC.

de la Dehesa, G. (2011). 'Eurozone Design and Management Failures. VoxEU.org, 18 May. https://voxeu.org/article/eurozone-design-and-management-failures

de la Dehesa, G. (2012). 'A Self-Inflicted Crisis? Design and Management Failures Leading to the Eurozone Crisis.' Group of Thirty Occasional Paper 86. Washington D.C:.

Debrun, X. and Masson, P.R. (2013). 'Modelling Monetary Union in Southern Africa: Welfare Evaluation for the CMA and SADC'. *South African Journal of Economics* Vol. 81(2) pp275–291.

Debrun, X., Masson, P. and Pattillo, C. (2005). 'Monetary Union in West Africa: Who might gain, Who might lose and why?' *Canadian Journal of Economics* Vol. 38(2) pp454–481.

Decressin, J, and Fatas. A. (1995). "Regional Labour Dynamics in Europe." *European Economic Review,* Vol.49 (9), pp. 1627–55.

Degryse, H. Elahi, M. A. and M. F. Penas (2013). 'Determinants of Banking Fragility: A Regional Perspective'. *European Central Bank Working Paper* 1567 (July).

Dellas, H. and Tavlas, G. S. (2009), "An Optimum Currency Area Odyssey". *Journal of International Money and Finance* pp 1117-1137.

Demirgue-Kunt, A. and E. Detragiache (2005). 'Cross Country Empirical Studies of Systemic Banking Distress: A Survey'. *IMF Working Paper* WP/05/96.

Derreumaux, P. (2013). 'The Renewal of African Banking Sector in 'New Players and New Banking Models for Africa' *Private Sector and Development Proparco's Magazine*, No. 16 May 2013.

Diebold, F.X. (1988), '*Empirical Modelling of Exchange Rate Dynamics'*. New York: Springer-Verlag.

Diop, C. (2007). 'L'UEMOA et la perspective d'une zone monétaire unique de la CEDEAO: les enseignements d'un modèle de gravité. *Document d'Etude et de Recherche* BCEAO, N° DER/07/01 – Avril, pp. 2-38.

Dornbusch, R. (1976). 'Expectations and Exchange Rate Dynamics'. *Journal of Political Economy*, Vol. 84, pp 1161-76.

Drummond, P., Aisen, A., Alper, E., Fuli, E. and Walker, S. (2015).*'Toward a Monetary Union in the East African Community Asymmetric Shocks, Exchange Rates, and Risk-Sharing Mechanisms*' African Department, International Monetary Fund.

Dufrenot, G. and Sugimoto, K. (2013). 'West African Single Currency and Competitiveness'. *Review of Development Economics*, Vol. 17(4) pp763–777.

Durevall, D. (2011). 'Pre-requisites for the Establishment of an Effective Monetary Union' International Growth Centre and University of Gothenburg Paper.

Dymski, G. A. (2013). 'The Eurozone Crisis as a Trilemma Forcefield: Fleming, Mundell and Power in Finance' *USR Political Economy Seminar Paper*, California. Accessed: http://ucrpoliticaleconomy.ucr.edu/wp-content/uploads/2014/05/Eurozone-Crisis-as-a-Trilemma-Forcefield-Fleming-Mundell-Power-in-Finance-Dymski-8-13.pdf

Ederer, S. and Weingartner, S. (2013). 'Remapping EMU on the Future Construction of Economic and Monetary Union.' *WWW for Europe Policy* Paper 5, September.

Edwards, S. (2006). 'Monetary Unions, External Shocks and Economic Performance: A Latin American Perspective. *Journal of International Economics and Economic Policy*, Vol. 3, pp. 225-247.

Eichengreen B. and Bayoumi T. (1999). 'Is Asia an optimum currency area? Can it become one? In S. Collignon, J. Pisani-Ferry and Y.C. Park (Eds.), *Exchange Rate Policies in Emerging Asian Countries*. London: Routledge.

Eichengreen, B. (1998). 'Does MERCOSUR need a Single Currency? *NBER* WP/6821.

Eichengreen, B., and von Hagen, J. (1995). 'Fiscal Policy and Monetary Union: Federalism, Fiscal Restrictions and the No-bail-out Clause.' *CEPR Discussion Paper* 1247. Centre for Economic Policy Research, London.

Eichengreen, B., Rose, A., and C. Wyplosz (1996). 'Contagious Currency Crises' *NBER Working Paper* No. 5681, July 1996.

Ekpoh, A.H. and Udoh, E. (2013). 'Policy Coordination Framework for the Proposed Monetary Union in ECOWAS.' *Advances in African Economic, Social and Political Development Series* (pp. 59–77), Springer.

Essaadi, E. (2017). 'The Feasibility of Currency Union in Gulf Cooperation Council Countries: A Business Cycle Synchronisation View'. *The World Economy*, Vol. 40 (10), pp. 2153-2171.

Falagiarda, M. (2010). 'Are the East African Countries ready for a Common Currency? Traditional Indicators and Cointegration Analysis'. School of Economics of the University of Reading. Available at:

http://www.tn.auf.org/CEAFE/Papiers_CEAFE10/Monnaie/Falagiarda.pdf, accessed July 8 2017.

Feldstein, M. (1997). 'The Political Economy of the European Economic and Monetary Union: Political Sources of an Economic Liability'. *The Journal of Economic Perspectives*, Vol. 11 (4) pp. 23-42.

Feldstein, M. (1997). EMU and International Conflict', *Foreign Affairs*, Vol. 76(6), pp. 45-60.

Fernandez-Villaverde, J., Garicano, L. and Santos, T. (2013). 'Political Credit Cycles: the Case of the Eurozone.' Journal of Economic Perspectives, Vol. 27(3), pp. 145-166.

Fidrmuc, J. (2005). 'The Endogeneity of the Optimum Currency Area Criteria and Intra-industry Trade: Implications for EMU Enlargement' in *Monetary Unions after EMU*, Paul De Grauwe and Jaques Melitz, (Eds). MIT Press.

Fisher, I. (1930) *The Theory of Interest*, New York: Macmillan.

Fleming, J. M. (1971). 'On Exchange Rate Unification'. *The Economic Journal*, Vol. 81, pp. 467-88.

Font-Vilalta, M., and Costa-Font, J. (2006). 'A Note on the Feasibility of a Monetary Area in the East Asia'. *Asia Europe Journal*, Vol. 4(1), pp. 53–58.

Foresti, F. (2011). 'Is Latin America an Optimal Currency Area? Evidence from a Structural Vector Auto-Regression Analysis'. *Studi Economici*, Vol. LXVI (104) pp. 43-68.

Frankel, J. (1979). 'On the Mark: A Theory of Floating Exchange Rates Based on Real Interest Differentials'. *American Economic Review*, Vol. 69, pp. 610-22.

Frankel, J. and A. Rose, 1997. 'Is EMU More Justifiable Ex-post than Ex-ante?' *European Economic Review*, 41, pp. 753-760.

Frankel, J. and Rose, A. K. (1995), Empirical Research on Nominal Exchange Rates, in *Handbook of International Economics*, Vol. 3, Gene Grossman and Kenneth Rogoff (eds.), (Amsterdam: Elsevier Science Publishers. pp. 1689-1729.

Frankel, J.A. (1981). 'The Collapse of Purchasing Power Parities during the 1970s'. *European Review*, Vol. 16, pp. 145-65.

Fratiani, M. and von Hagen, J. 1992. 'The European Monetary System and European Monetary Union.' Oxford: Westview Press.

Frenkel, J and Rose, K.A. (1998), 'The Endogeneity of the Optimum Currency Area Criteria. *The Economic Journal*, Vol. 108 pp 1009-1025.

Frenkel, J. (1976). 'A Monetary Approach to the Exchange Rate: Doctrinal Aspects and Empirical Evidence'. *Scandinavian Journal of Economics*, Vol.76, pp. 200-224.

Frenkel, J. (1976). A Monetary Approach to the Exchange rate: Doctrinal Aspects and Empirical Evidence. Scandinavian Journal of Economics 76, pp 200-224.

Frenkel, J. and Rose, A. (1996),' A Panel Project on Purchase Power Parity: Mean Reversion within and Between Countries', *Journal of International Economics*, 40 pp. 209-224.

Friedman, M. (1963). '*Inflation Causes and Consequences' Bombay*: Asian Publishing House.

Gandolfo, G. (1992), 'Monetary Union' in P. Newman, Milgate, M. and Eatwell, J. (eds), *The New Palgrave Dictionary of Money and Finance 2*, Macmillan London, pp 663-685.

Ghartey, E. E. (2008). 'Is the Caribbean Community an Optimum Currency Area?' *Journal of Economic Studies of International Development*, Vol. 8 (1).

Giavazzi, F, Micossi, S. and Miller, M. (1988). '*The European Monetary System*.' London and Cambridge: Centre for Economic Policy Research and Cambridge University Press.

Gibson, H. D., Pavilos, T. and Tavlas, G. S. (2013), 'The Crisis in the Euro area: An Analytic Overview', *Journal of Macroeconomics,* Vol. 39 (b), pp. 233-239.

Girton, L. and D. Roper (1977) 'A Monetary Model of Exchange Market Pressure Applied to the Postwar Canadian Experience'. *American Economic Review*, 67, pp. 537-548.

Golub, S.S. (2012). 'Entrepôt Trade and Smuggling in West Africa: Benin, Togo, and Nigeria.' *The World Economy* Vol. 35(9), pp. 1139–61.

Golub, S.S. (2015). 'Informal Cross-Border Trade and Smuggling in Africa' in *Handbook on Trade and Development: Africa*, Eds.: Oliver Morrissey, Richardo, A. Lopez and Kishor Sharma. Cheltenham: Edward Elgar pp. 179-209.

Goodhart, C. (1996) 'European Monetary Integration', *European Economic Review*, Vol. 40, pp1083-1090.

Goodhart, C. A. E. (2014). '*Lessons for Monetary Policy from the Euro-area Crisis*'. Journal of Macroeconomics 39 (B) 378-382.

Grabowski, R. and Horvath, J. (1999). 'Economic Integration of Central America and the Caribbean'. *Journal of Economic Development,* Vol. 24 (1).

Grandes, M. (2003). 'Macroeconomic Convergence in Southern Africa: The Rand Zone Experience'. *OECD Development Centre Working Paper* No. 231, Paris.

Groen, J. J. J. (2000). 'The Monetary Exchange Rate Model as a Long-run Phenomenon'. *Journal of International Economics*, Vol. 52, pp. 299–319.

Gros, D. and Thygesen, N. (1992). 'European Monetary Integration.' London: Longman.

Grubel, H., 1970. 'The Theory of Optimum Currency Areas'. *Canadian Journal of Economics*, May, pp. 318-324.

Guillaume, D.M. and Stasavage, D. (2000). 'Improving Policy Credibility: Is there a case for African Monetary Unions'. *World Development,* Vol. 28(8) pp1391–1407.

Gujarati, D. N. and Porter, D.C. (2010). '*Essentials of Econometrics'*. New York: McGraw Hill.

Gulzar, W. A. (2015). 'Assessing the Potentials for the Establishment of Monetary Union among GCC Countries '. *Life Science Journal*, Vol. 12 (10), pp. 30-43.

Habeler, G. (1970), 'The International Monetary System: Some Recent Development and Discussions' in *Approaches to Greater Flexibility in Exchange Rates*, edited by George Halm, Princeton University Press PP 115-23.

Hamid, H., Said, A. and Sbia, R. (2015). 'Empirical Evidence on the Long-run Money Demand Function in the Gulf Cooperation Council Countries'. International Journal of Economies and Financial Issues, Vol. 5 (2), pp. 603-612.

Han, K., and Lee, Y. (2010). 'East Asian Monetary Integration and the Composite Index of OCA Criteria'. *Korean and the World Economy*, Vol. 11(2), pp. 297-339.

Harvey, S.K. and Cushing, M.J. (2015). 'Is West African Monetary Zone (WAMZ) a Common Currency Area?' *Review of Development Finance* Vol. 5(1) pp53–63.

Heckman, J. J. (1981). 'The Incidental Parameter Problem and the Problem of Initial Conditions in Estimating a Discrete Time-discrete Data Stochastic Process'. In *Structural Analysis of Discrete Data and Econometric Application*, ed. C. F. Manski and D. L. McFadden, pp. 114-178. Cambridge, MA: MIT Press.

Hein, E. and Truger, A. (2005). 'European Monetary Union: Nominal Convergence, Real Divergence and Slow Growth?' *Structural Change and Economic Dynamics*, Vol. 16 (1) pp. 7-33.

Heritage Foundation (2015). 'Highlights of the 2015 Index of Freedom'. Available at: https://www.llri.lt/wp-content/uploads/2015/06/IEF-highlights-2015.pdf Accessed on 15 June 2017.

Hill, R. C., Griffiths, W.E. and G. C. Lim (2008). *'Principles of Econometrics 3rd Edition*'. John Wiley and Sons: New Jersey.

Holmes, M., (2002). 'New Evidence on Real Exchange Rate Stationarity and Purchasing Power Parity in Less Developed Countries', *Journal of Macroeconomics* Vol. 23, pp. 601–614.

Honohan, P. and T. Beck (2007). '*Making Finance Work for Africa'*. Washington DC: World Bank/International Bank for Reconstruction and Development.

Houssa, R. (2008). 'Monetary Union in West Africa and Asymmetric Shocks: A Dynamic Structural Factor Model Approach'. *Journal of Development Economics* Vol. 85(1–2) pp319–347.

Husted, S. and Melvin, M. (2013). '*International Economics, 9th Edition'* Harlow: Pearson Education Limited.

Husted, S. and MacDonald, R. (1998). 'Monetary-based Models of the Exchange Rate: A Panel Perspective'. *Journal of International Financial Markets, Institutions and Money*, Vol. 8, pp. 1–19.

Ibrahim, S. (2008). 'A Study of Optimum Currency Area in East Asia: A Cluster Analysis. *Journal of Economic Integration*, Vol. 23 (4), pp. 765–790.

ILO, (2014).'*Transitioning from the Informal to the Formal Economy'*. Geneva: International Labour Office.

IMF (2013). 'Nigeria: Financial Sector Stability Assessment'. *IMF Country Report* 13/140. May, 2013.

Ingram, J.C (1969), 'Comment: The Currency Area Problem' in *Monetary Problems of the International Economy*, Robert A. Mundell and Alexander R. Swoboda (eds), The University of Chicago press, Chicago and London.

Ingram, J.C (1969), 'Comment: The Currency Area Problem' in *Monetary Problems of the International Economy*, Robert A. Mundell and Alexander R. Swoboda (eds), The University of Chicago press, Chicago and London.

Ishiyama, Y (1975), 'The Theory of Optimum Currency Areas: A Survey', *International Monetary Fund IMF Staff Papers* 22(2) PP 344-83.

Iyare, S.O., Lorde, T., Francis, B. (2005). 'West African States (ECOWAS)'. *West Africa Journal of Monetary and Economic Integration* Vol. 5 (2(a)).

Jefferis, K.R. (2007). 'The Process of Monetary Integration in the SADC Region'. *Journal of Southern African Studies* Vol. 33(1) pp83–106.

Jerven, M. and Johnston, D. (2015). 'Statistical Tragedy in Africa? Evaluating the Database for African Economic Development. *The Journal of Development Studies*, Vol. 51 (2) pp 111-115.

Kahn, G. A. (2012). "The Taylor Rule and the Conduct of Central Banking," in Evan F. Koenig, Robert Leeson, and George A. Kahn, eds., *The Taylor Rule and the Transformation of Monetary Policy*. Stanford: Hoover Institution Press, pp. 63-101.

Kalemli-Ozcan, S., B.E. Sørensen and O. Yosha (2003). 'Economic Integration, Industrial Specialization, and the Asymmetry of Macroeconomic Fluctuations'. *Journal of International Economics* (October).

Kamar, B. and Bakardzhieva, D. (2006). 'The Appropriate Monetary Policy Coordination for the GCC Monetary Union'. *Topics in Middle Eastern and African Economies*, Vol. 8.

Kamar, B. and Naceur, S. B. (2007). 'GCC Monetary Union and the Degree of Macroeconomic Policy Coordination'. *International Monetary Fund Working Paper*, WP/07/249.

Kandil, M. and Trabelsi, M. (2012). Is the Announced Monetary Union in GCC Countries Feasible? A Multivariate Structural VAR Approach. *Middle East Development Journal*, Vol. 4 (1).

Kappel, S. (2015). 'An Evaluation of Selected Economic Areas According to Similarity of Supply and Demand Shocks'. *Review of Economic Perspectives*, Vol. 15 (2), pp-221-240.

Karras, G. (2007). 'Is Africa an Optimum Currency Area? A comparison of macroeconomic Costs and Benefits'. *Journal of African Economies* Vol. 16(2) pp234–258.

Kauppi, H. and P. Saikkonen (2005). 'Predicting US Recession with Dynamic Binary Response Models'. *Helsinki Centre of Economic Discussion Paper* 79, November 2005.

Kawai M. and Motonishi T. (2005). 'Macroeconomic Interdependence in East Asia: Empirical Evidence and Issues'. In *Asian Economic Cooperation and Integration Progress, Prospects and Issues*. Manila: Asian Development Bank.

Kawai, M. (1998) 'Optimum Currency Areas' in *The New Palgrave: A Dictionary of Economics* (K-P) (eds) Eatwell, J; Milgate, M and Newman P.) Palgrave Publishers Limited, Hampshire.

Kawai, M. (2008). 'Toward a Regional Exchange Rate Regime in East Asia. *Pacific Economic Review*, Vol. 13(1), pp. 83–103.

Kawai, M., and Takagi, S. (2005). 'Strategy for a Regional Exchange Rate Arrangement in East Asia: Analysis, Review, and Proposal'. *Global Economic Review*, Vol. 34(1), pp. 22–65.

Kawasaki, K. (2012). Are the ASEAN plus Three Countries Coming Closer to an Optimum Currency Area? Chinese Economic Policy Review 2012.

Kendall, P. (2000). 'Exchange Rate Convergence in CARICOM'. *Social and Economic Studies*, Vol. 49(2-3), 139-166.

Kenen, P (1969) The Theory of Optimum Currency Areas An Ectectic View in R .A Mundell and A.K Soboda (eds), Monetary Problems of the International Economy Chicago, Ill: University of Chicago Press.

Khamfula, Y. and Huizinga, H. (2004). 'The Southern African Development Community: Suitable for a Monetary Union?' *Journal of Development Economics* Vol. 73(2) pp699–714.

Khamfula, Y. and Mensteab, T. (2004). 'South Africa and Southern African Monetary Union: A Critical Review of Sources of Costs and Benefits'. *South African Journal of Economics* Vol. 72(1) pp37–49.

Kishor, N.K. and Ssozi, J. (2011). 'Business Cycle Synchronization in the Proposed East African Monetary Union: An Unobserved Component Approach. *Review of Development Economics* Vol. 15(4) pp664–675.

Koenker, R. and Bassett (1978). 'Regression Quantiles'. *Econometrica*, Vol. 46 (1), pp. 33-50.

Krugman, P. (1989), '*Exchange Rate Instability'*, MIT Press, Cambridge, Massachusetts.

Krugman, P. (1991). '*Geography and Trade'*. 1991. Cambridge: MIT Press.

Krugman, P. (2012). 'Revenge of the Optimum Currency Area' *NBER Macroeconomics Annual*, Vol. 27(1), pp. 439-448.

Krugman, P. and Venables, A. (1993). 'Integration, Specialisation and the Adjustment.' CEPR Discussion Paper 886. CEPR London.

Krugman, P. R., Obstfeld, M. and Melitz, M. (2015). '*International Economics: Theory and Policy, 10th Edition*'. Harlow: Pearson Education Limited.

Krugman, P., 1993. 'Lessons of Massachusetts for EMU' in F. Torres and F. Giavazzi (eds.) *Adjustment and Growth in the European Monetary Union*, Cambridge University Press, New York.

Kydlland, F. and Prescott, E. (1977) 'Rules Rather than Discretion: The inconsistency of Optimal Plans', *Journal of Political Economy*, 85 pp 473- 491.

Laakkonen, H. (2007), "Impact of Macroeconomic News on Exchange Rate Volatility", Finnish Economic Papers, 20, 23-40.

Laeven, L. and F. Valencia (2010). 'Resolution of Banking Crises: The Good, the Bad and the Ugly'. *IMF Working Paper*, WP/10/146

Laeven, L. and F. Valencia (2012). 'Systemic Banking Crises Database: An Update'. *IMF Working Paper* 12/163.

Lane, P. R. (2006). 'The Real Effects of EMU', *Journal of Economic Perspectives*, Vol. 20, pp. 47-66;

Lee, G. H. Y and Koh, S. G. M (2012). 'Prospects of a Monetary Union in East Asia'. *Economic Modelling*, Vol. 29(2). Pp. 1440-1458.

Lee, G., & Azali, M. (2012). 'Is East Asia an optimum currency area?' *Economic Modelling*, 29(2), 87-95

Lee, G.H., Azali, M. (2010). 'The Endogeneity of the Optimum Currency Area in East Asia. *Economic Modelling*, 27(1), 165-170.

Lee, J-W., Y. Park, Y. C., and Shin K. (2004). 'A Currency Union in East Asia' in *Asian Development Bank ed. Monetary and Financial Integration in East Asia: The Road Ahead*, Vol. 2, pp. 139-175 Basingstoke: Palgrave MacMillan.

Leeper, E. M. (1991): "Equilibria under 'Active' and 'Passive' Monetary and Fiscal Policies," *Journal of Monetary Economics*, 27(1), 129–147.

Leeper, E. M. (2016): "Understanding Inflation as a joint Monetary-Fiscal Phenomenon. *Handbook of Macroeconomics* Vol. 2 ed. J. B. Taylor and H. Uhlig. Elsevier Press.

Lefiller, J (2013). 'Strengthening the Africa Banking sector: How Development Finance Institution Can Help'. *The African Business Review*. Sept. 2013.

Lepetit, L., Rugemintwari, C. and Strobel, F. (2014). 'Monetary, Financial and Fiscal Stability in the East African Community: Ready for a monetary union?' *The World Economy* Vol. 38(8) pp1179–1204.

Liu, X. (2012). 'Does East Asia move towards an Optimum Currency Area? Evidence from the Multivariate Structural VAR Analysis'. *International Journal of Economics and Finance*, Vol. 4 (12), pp. 159-177.

Loayza N., Lopez H. and Ubide A. (2001). 'Sectoral Macroeconomic Interdependence: Evidence for Latin America, East Asia, and Europe. *IMF Staff Papers*, Vol. 48 (2), pp. 367–396.

Louis, R. J., Ball, F. and Osman, M. (2012). On the Feasibility of Monetary Union among Gulf Cooperation Council (GCC) Countries: Does the Symmetry of Shocks extend to the Non-oil Sector?' *Journal of Economics and Finance*, Vol. 36 (2), pp. 319-334.

Lucas, R. (1973). 'Some International Evidence on Output-Inflation Trade-offs. *American Economic Review*. Vol.63 (3), pp 326-34.

Lux, T., and Marchesi, M. (2000). 'Volatility Clustering in Financial Markets, a Microsimulation of Interacting Agents', *International Journal of Theoretical and Applied Finance*. 3, 675-702.

Lyons, R. K. (2001). '*The Microstructure Approach to Exchange Rates.*' Cambridge, Massachusetts: MIT Press.

Mafusire, A. and Brixiova, Z. (2013) Macroeconomic Shock Synchronisation in the East African Community'. *Global Economic Journal* Vol.13 (2) pp261–280.

Mark, N. C. (1990): 'Real and Nominal Exchange Rates in the Long Run: An Empirical Investigation' *Journal of International Economics*, Vol. 28, pp. 115 -136.

Marzovilla, O. (2014). 'Economic Diversification in GCC Countries and the Optimality of a Monetary Union'. European Scientific Journal, Vol. 1.

Masson, P. (2006). 'New monetary unions in Africa: A Major Change in the Monetary Landscape?' *International Economics*, CEPII Research Centre, Issue 3Q pp87–105.

Masson, P. (2008). 'Currency Unions in Africa: Is the Trade Effect Substantial Enough to Justify their Formation?' *The World Economy* Vol. 31(4) pp533–547.

Masson, P.R. and Taylor M.P. (1993) '*Policy Issues in the Operations of Currency Unions'* Cambridge University Press.

McCallum, B. T. (1987). 'The Case for Rules in the Conduct of Monetary Policy: A Concrete Example'. *Review of World Economics*, Vol. 123 (3) pp. 415-429.

McCallum, B. T. (1988). 'Robustness Properties of a Rule for Monetary Policy'. *Carnegie-Rochester Conference Series on Public Policy*, Vol. 29 (Autumn), pp.173-203.

McCallum, B. T. (1999). 'Recent Developments in the Analysis of Monetary Policy Rules'. Federal Reserve Bank of St. Louis *Review*. November/December 1999.

McCallum, B. T. (2002). 'The Use of Policy Rules in Monetary Policy Analysis'. Response to the Shadow Open Market Committee. *Research Showcase of Carnegie-Mellon University.* 11-2002.

McKinnon, R. (1963), 'Optimum Currency Areas', *American Economic Review* Vol: 53 pp 717-24.

McKinnon, R. (2001). 'Mundell, the Euro and Optimum Currency Areas.' *Essays in Honour of Robert Mundell*, ed. T. Courchene. Kingston, Ontario: Queens University.

McKnight, S. and Sanchez, M. R. (2014). 'Is a Monetary Union Feasible for Latin America? Evidence from Real Effective Exchange Rates and Interest Rate Pass-through Levels'. *Estudios Economicos*, Vol. 29 (2), pp. 225-262.

Medhioub, I. and Jedida, L. B. (2017). 'GCC Monetary Union and the Transmission of Business Cycles: Evidence from Temporal Correlation'. *Internal Journal of Monetary Economics and Finance*. Vol. 10 (1).

Medina, L. and Schneider, F. (2018). 'Shadow Economies Around the World: What Did We Learn Over the Last 20 Years?' *IMF Working Paper*. No. WP/18/17.

Meese, A and Rogoff, K (1983). 'Empirical Exchange Rate Models of the Seventies', *Journal of International Economics*, Vol.14, pp.3-24.

Melitz, J. (2004). 'Risk Sharing and EMU', *Journal of Common Market Studies*. Special Issue Nov. 2004; 42(4): 815-40.

Mensah, I. (2016). 'Monetary and Economic Union in West Africa: An Analysis on Trade.' *International Journal of Business and Economic Sciences Applied Research*, Vol. 8(2), pp. 87-118.

Miller, E. (1988), 'Why a Weekend Effect?' *Journal of Portfolio Management*, 14, 42-48.

Miller, T. and Holmes, K. R. (2011). '*2011 Index of Economic Freedom'*. Washington and New York: The Heritage Foundation and Dow Jones Company.

Mintz, N.N. (1970), 'Monetary Union and Economic Integration' *The Bulletin*, New York University Graduate School of Business Administration, Institute of Finance.

Mishra, R. K. and Sharma, C., (2010). 'Real Exchange Rate Behaviour and Optimum Currency Area in East Asia: Evidence from Generalized Purchasing Power Parity'. *International Review of Financial Analysis* Vol. 19, pp. 205–213.

Mkenda, B.K. (2001). 'Is East Africa an Optimum Currency Area? Working Papers in Economics, No. 41. School of Economics and Commercial Law, Goteborg University.

Mlachila, M. Park, S.G. and M. Yabara (2013). 'Banking in Sub-Saharan African: The Macroeconomic Context'. International Monetary Fund, African Department.

Mongelli, F.P. (2002), 'New Views on the Optimum Currency Area Theory: What is EMU telling us'. *ECB Working Pap*er No 138 Frankfurt on Main: European Central Bank.

Mongelli, F.P. (2005), 'What is European Economic and Monetary Union (EMU) telling us about the Optimum Currency Area Properties?' *Journal of Common Market Studies*, Volume 43, No. 3 pp. 607-35.

Mongelli, F.P. (2008) 'European Economic and Monetary Integration and the Optimum Currency Area Theory', *Economic Papers* 302, European Communities.

Moreira, M.M. and Mendoza, E. (2007). 'Regional Integration: What is in it for CARICOM?' *Economia*. Fall, 2007, pp. 97-142.

Mundell, R. (1973), Uncommon Arguments for Common Currencies'. In Johnson, H and S Woboda, A (eds) *The Economics of Common Currencies* (London, 'Allen and Unwin).

Mundell, R.A. (1961), 'A Theory of Optimum Currency Areas', *American Economic Review* Vol 53.

Mussa, M. (1976). 'The Exchange Rate, the Balance of Payments, and Monetary and Fiscal Policy under a Regime of Controlled Floating'. *Scandinavian Journal of Economics*, Vol. 78, pp. 229-48.

Navarro, K.D. (2015). Currency Union and East Asia'. *Mediterranean Journal of Social Sciences*, Vol. 6 (2), pp. 415-427.

Neumeyer, P. A. (1998). 'Currencies and the Allocation of Risk: The Welfare Effects of a Monetary Union'. *American Economic Review*, 88(1), 246–259.

Ngiam, K. J., and Yuen, H. (2001). 'Monetary Cooperation in East Asia: A Way Forward'. *The Singapore Economic Review*, Vol. 46(2), pp. 211–246.

Nguyen T. (2007). 'East Asian Currency Area: A Fuzzy Clustering Analysis of Homogeneity. *Development and Policies Research Centre Working Paper* No. 10. Vietnam

Obaseki, P.J. (2005). 'The Future of the West African Monetary Zone (WAMZ) Programme'. *West Africa Journal of Monetary and Economic Integration* Vol. 5 (2(a)).

Obradovic, D. (1996). 'Policy Legitimacy and the European Union', Journal of Common Market Studies, Vol. 34(2), pp. 191-221.

Observatory of Economic Complexity (2016). '2015 Economic Complexity Index' Available at: https://atlas.media.mit.edu/en/rankings/country/eci/ Accessed on 22 July 2017.

Officer, L. (1976). 'The Purchasing Power Parity Theory of Exchange Rates: A Review Article'. *IMF Staff Paper*, Vol. 23, pp. 1-6.

Ogunkola, O. (2005). 'An Evaluation of the Viability of a Single Monetary Zone in ECOWAS. AERC Research Paper No. 147, African Economic Research Consortium, Kenya.

Ojo, M.O. (2005). Towards a Common Currency in West Africa: Progress, Lessons and Prospects'. *West Africa Journal of Monetary and Economic Integration* Vol. 5 (2(a)).

Okafor, H. O. (2013). 'Estimating the Costs and Benefits of a Common Currency for the Second West African Monetary Zone'. *Journal of Economic and Behavioural Studies*, Vol. 5(2), pp. 57-68.

Omotor, D.G and Niringiye, A (2011) 'Optimum Currency Area and Shock Asymmetry: A Dynamic Analysis of the West African Monetary Zone' *Romania Journal of Economics Forecasting* No3/2011.

Patroba, H. and Nene, M. (2013). Is SACU Ready for a Monetary Union?' South African Institute of International Affairs Occasional Paper No. 143.

Pesaran M.H., and Pesaran, B. (1997). Working with Microfit 4.0: Interactive Econometric Analysis. Oxford, Oxford University Press.

Pesaran, M. H., Shin, Y. and Smith, R.J. (2001). 'Bounds Testing Approaches to the Analysis of Level Relationships'. *Journal of Applied Econometrics*, Vol. 16, pp. 289-326.

Phillips, A. W. (1958). "The Relation between Unemployment and the Rate of Change of Money Wage Rates in the United Kingdom, 1861-1957", *Economica,* New Series. Vol. 25(100) pp 283-299.

Pilbeam, K. (2010). '*Finance and Financial Markets, Third Edition'*, Basingstoke: Macmillan Palgrave.

Pilbeam, K. (2018). '*Finance and Financial Markets, 4th Edition*. London: Palgrave Macmillan Publishers Limited.

Portes, A., Castells, M. and Benton, L. Eds. (1989). '*The Informal Economy: Studies in Advanced and Less Developed Countries*'. Baltimore: The Johns Hopkins University Press

Praet, P. (2013). 'The Crisis Response in the Euro Area: The Challenges Ahead" Speech Deliver at The Pioneer Investments' Colloquia Series "Redrawing the Map: New Risk, New Reward" organised by Unicredit S.p.A., Beijing, 17 April.

Prager, J. (1983). 'Two Cheers for the Underground Economy'. *Economic Policy Papers,* Centre for Applied Economics, New York University.

Quah, C. H. (2009). The Feasibility of East Asian Monetary Union as an Optimum Currency Area. *International Journal of Asia Pacific Studies,* Vol. 5(2), pp. 65–90.

Raji, R. O. (2012).'Real Exchange Rates Misalignment and Economic Performance of West African Monetary Zone: Implications for Macroeconomic Unionisation'. *MPRA Paper* No. 37385.

Rana, P. B. (2007). 'Economic Integration in East Asia: Trends, Prospects, and a Possible Roadmap *Economic Growth Centre Working Paper Series* 07/01. Nanyang Technological University.

Raoudha, A. (2014). 'Market Structure and Bank Fragility: Application to the Tunisia Banking System'. *Zagreb International Review of Economic and Business* 17 (2) pp. 1-20.

Rapach, D. E. and Wohar, M. E. (2004). 'Testing the Monetary Model of Exchange Rate Determination: A Closer Look at Panels'. *Journal of International Money and Finance*, Vol. 23, pp. 867–95.

Reyneri, E. (2003). 'Illegal Immigration and the Underground Economy', in *Proceedings of the Challenges of Immigration and Integration in the European Union and Australia Conference*, Sydney: University of Sydney.

Robert Mundell, R. (2000). 'Currency Areas, Exchange Rate Systems and International Monetary Reform," CEMA Working Papers: Serie Documentos de Trabajo. 167, Universidad del CEMA.

Rose, A and Van Wincoop, E (2001) 'National Money as a Barrier to Trade: The Real Case for Currency Union', *America Economic Review* (Papers and Proceedings) Vol. 91 No 2 pp 386-90.

Rose, A. (2000). 'One Money, One Market: Estimating the Effect of Common Currencies on Trade'. *Economic Policy*, vol. 30, pp. 9-45.

Rusuhuzwa, T.K. and Masson, P. R. (2012). 'Design and Implementation on a Common Currency Area in the East African Community' University of Toronto Economics Working Paper 451, April.

Rusuhuzwa, T.K. and Masson, P.R. (2012). 'Design and Implementation of a Common Currency Area in the East African Community'. University of Toronto, Department of Economics Working Paper No. 451, Toronto.

Sagbamah, (2005). 'Perspectives on the European Monetary Union: Lessons for the Economic Community of West African States (ECOWAS)'. *West Africa Journal of Monetary and Economic Integration* Vol. 5 (2(a)).

Saint-Paul, G. and S. Bentolila (2000). 'Will EMU increase Eurosclerosis?' *CEPR Discussion Paper*, No. 2423, April.

Saka, J.O., Onafowokan, I.A. and Adebayo, A.A. (2015). 'Analysis of Convergence Criteria in a Proposed Monetary Union: A Study of the Economic Community of West African States'. *International Journal of Economic and Financial Issues* Vol. 5(1) pp230–239.

Sarmidi, T. (2010). 'How well do Monetary Fundamentals Forecast Exchange Rates in Developing Economies?' *Capital Market Review*, Vol. 18 (1), pp. 23-43.

Sato, K., and Zhang, Z. (2006). Real Output co-movements in East Asia: Any evidence for a monetary union? World Economy, 29(12), 1671–1689.

Sato, K., Zhang, Z., and Allen, D. (2009). The suitability of a monetary union in East Asia: What does the cointegration approach tell? Mathematics and Computers in Simulation, 79(9), 2927-2937.

Schneider, F. (2010). 'The Shadow Economy and Work in the Shadow: What Do We (Not) Know?' *IZA Discussion Paper*, No. 6423.

Schneider, F. and Enste, D. (2002). '*The Shadow Economy: Theoretical Approaches, Empirical Studies, and Political Implications'*. Cambridge: Cambridge University Press.

Schwartz, P. (2013). 'Why the Euro failed and How it will Survive'. *Cato Journal*, Vo. 33 (3), pp. 521-534.

Sharma, C. and Mishra, R. K. (2012). 'Is an Optimum Currency Area Feasible in East and South East Asia?' Global Economic Review Perspectives on East Asian Economies and Industries, Vol. 41(3).

Sheikh, K.A., Azam, M.N., Rabby, T.G., Alam, G.M. and Khan, I. (2011). 'Monetary Union for the Development Process in the East African Community: Business Cycle Synchronisation Approach'. *African Journal of Business Management* Vol. 5(17) pp7632–7641.

Smith, P. (1994). 'Assessing the Size of the Underground Economy: The Canadian Statistical Perspectives'. *Canadian Economic Observer*, Catalogue No. 11-010, pp. 16-33.

Smith, P. and Wickens, M. (1984). '*An Empirical Investigation into the Causes of the Failure of the Monetary Model of the Exchange Rate'*. London: Centre for Economic Policy Research.

Soderban, M. (2004). '*Estimation of Binary Choice Models with Panel Data*'. ERSA Training Workshop Lecture Note 5.

Sosvilla-Rivero, S. and García, E. (2006). 'Purchasing Power Parity Revisited, in *International Macroeconomics: Recent Developments*'. Morales Zumaquero, A. (Ed), Nova Science Publishers, New York, pp. 1–37.

Stewart, M. (2006). 'Maximum Simulated Likelihood Estimation of Random Effect Dynamic Probit Model with Autocorrelated Error'. *The Stata Journal*, 6 (2) pp. 255-272.

Taylor, J. B. (1993): "Discretion versus Policy Rules in Practice," *Carnegie-Rochester Conference Series on Public Policy*, 39, 195–214.

The New Research Europe Trust (2001). '*The Case against the Euro'*. Ed. J. Bush. The New Europe Research Trust.

Theil, H. (1958). '*Economic Forecasts and Policy'*. Amsterdam: North Holland.

Theil, H. (1966). '*Applied Economic Forecasting'*. Chicago: Rand McNally.

Theil, H. (1967). '*Economics and Information Theory'*, Amsterdam: North Holland.

Thorpe, M. (2008). 'The Suitability of the GCC for Monetary Union'. *The International Journal of Business and Management*, Vol. 3 (20), pp. 71-83.

Tower, W. and Willett, T. (1976) '*The Theory of Optimum Currency Areas and Exchange Rate Flexibility: A More General Framework'*, Special Papers in International Economics 11 Princeton University

Tsangarides, C.G. and Qureshi, M.S. (2008). 'Monetary Union Membership in West Africa: A Cluster Analysis'. *World Development* Vol. 36(7) pp1261–1279.

Tsangarides, C.G., Ewenczyk, P. and Hulej, M. (2006). 'Stylized Facts on Bilateral Trade and Currency Unions: Implications for Africa'. *IMF Working Paper* No. WP/06/31.

Turner, P. and Pentecost, E. (2010). 'Demand and Supply Shocks in the Caribbean Economies: Implications for Monetary Union'. *World Economy*, Vol. 33 (10).

Uz, I. and Ketenci, N. (2008). 'Panel Analysis of the Monetary Approach to Exchange Rates: Evidence from Ten New EU Members and Turkey'. *Emerging Markets Review*, Vol. 9, pp. 57–69.

Volz, U. (2010). 'The Standard Approach: The Theory of Optimum Currency Areas'. *Prospects for Monetary Cooperation and Integration in East Asia*, pp. 49-102. USA: Masachusetts Institute of Technology

Wang, J.-Y., Masha, I., Shirono, K. and Harris, L. (2007). 'The Common Monetary Area in Southern Africa: Shocks, Adjustment, and Policy Challenges'. *IMF Working Paper* No. 07/158.

WEF (2015). '*The Global Competitiveness Report 2015-2016*'. Geneva: World Economic Forum.

Woodford, M. (2007). 'How Important is Money in the Conduct of Monetary Policy?" Manuscript, Columbia University'. *Journal of Money, Credit and Banking*, Vol. 40 (8), pp. 1561-1598.

Wooldridge, J. M. (2013). '*Introductory Econometrics: A Modern Approach, 5th Edition*'. South Western Cengage Learning, USA: Mason.

World Bank, (2013). *Estimating Trade Flows, Describing Trade Relationship and Identifying Barriers in Cross-Border Trade between Cameroon and Nigeria*. Report No. 78283.

Wyplosz, C. (2006). 'European Monetary Union: The Dark Sides of a Major Success." *Economic Policy,* Vol. 21(46), pp 207–61.

Yehoue, E. (2005). On the Pattern of Currency Blocs in Africa. *IMF Working Paper* No. 05/45.

Yuen, H. (2000). 'A Cluster-based Approach for Identifying East Asian Economies: A Foundation for Monetary Integration, *Department of Economics Working Paper Series*. Singapore: National University of Singapore.

Zehirun, M.F., Breitenbach, M.C. and Kemegue, F. (2015). 'Assessment of Monetary Union in SADC: Evidence from Cointegration and Panel Unit Root Tests. Economic Research Southern Africa (ERSA) Paper No. 945.

Zhang, S., Lowinger, T.C. (2006). 'An Empirical Test of Purchasing Power Parity in Selected Developed Countries: A Panel Data Approach', *International Economic Journal* Vol. 20, pp. 79-86.

Zhao, X. and Kim, Y. (2004). 'Is the Eastern Caribbean Currency Union an Optimum Currency Area'? *Journal of Developing Areas*, Vol. 48 (1) pp 291-313.

APPENDIX 1.1

Nominal Output Data Available for the WAMZ Countries

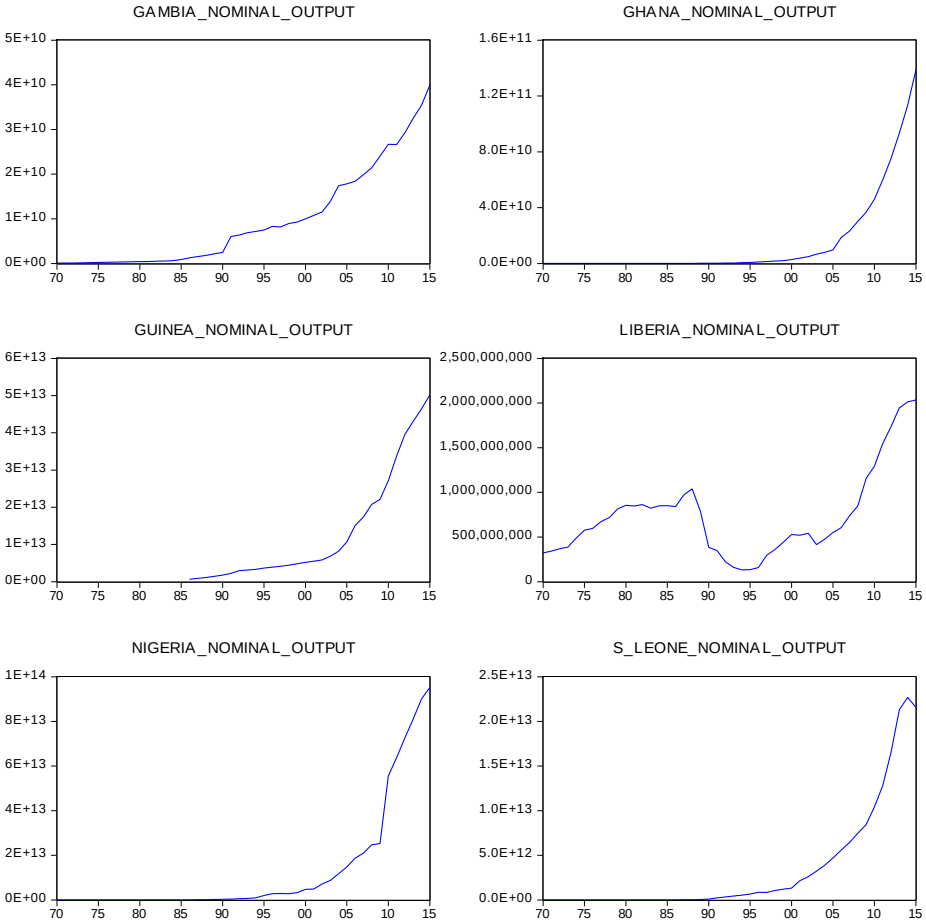


Figure: 1.7: Real Output Data Available for the WAMZ Countries

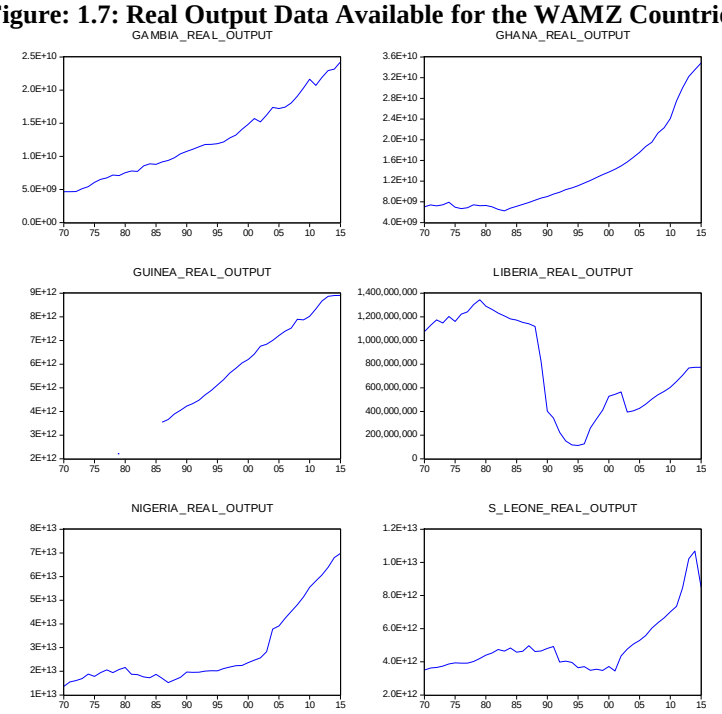


Figure: 1.8: Inflation (GDP Deflator) Data Available for the WAMZ Countries

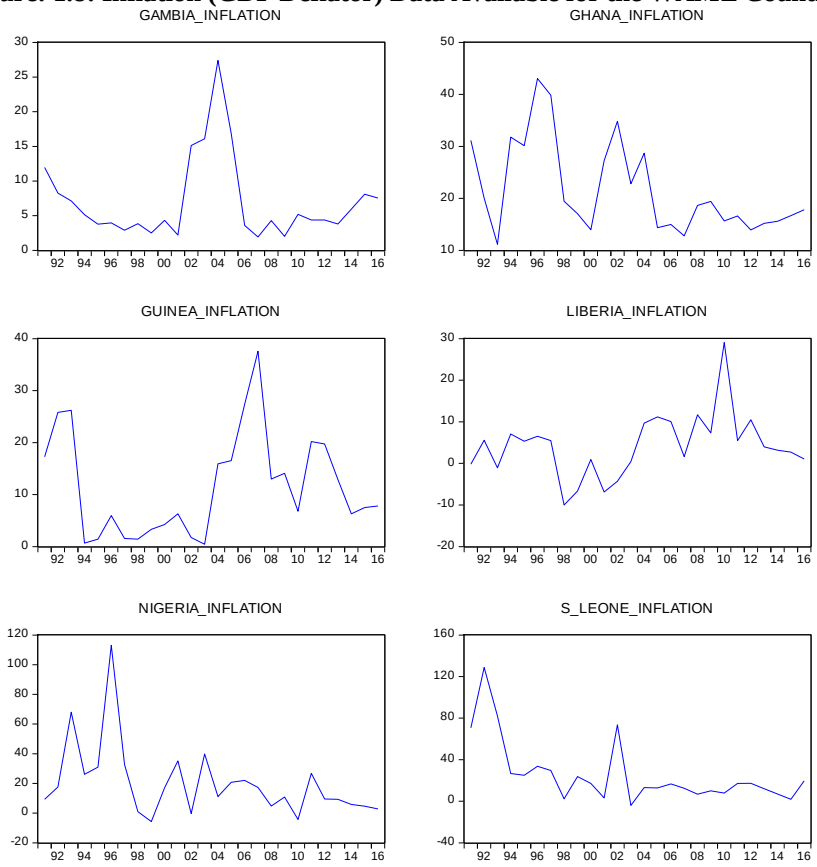


Figure: 1.9: Inflation (Consumer Price Index) Data Available for the WAMZ Countries

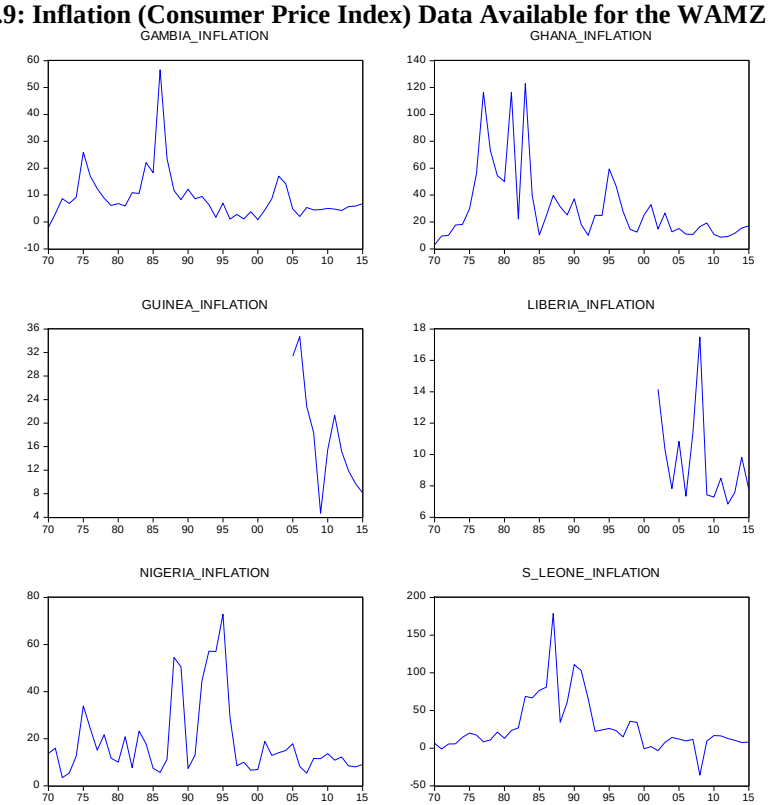


Figure: 1.10: Real Output Data Available for the WAMZ Countries

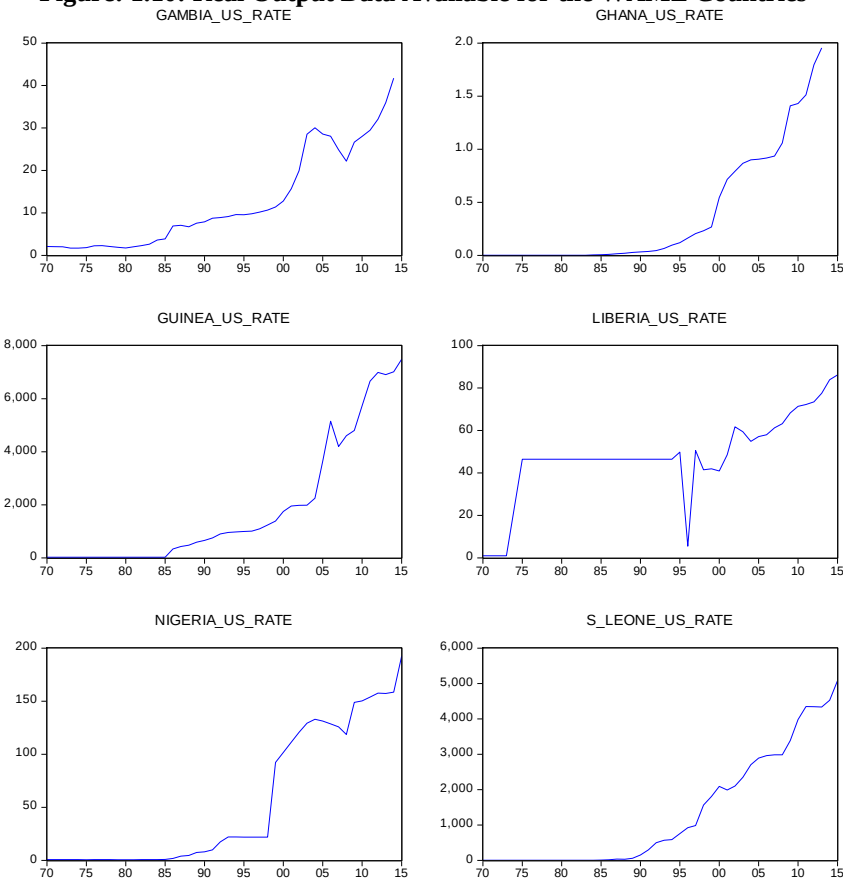


Figure: 1.11: Real Output Data Available for the WAMZ Countries

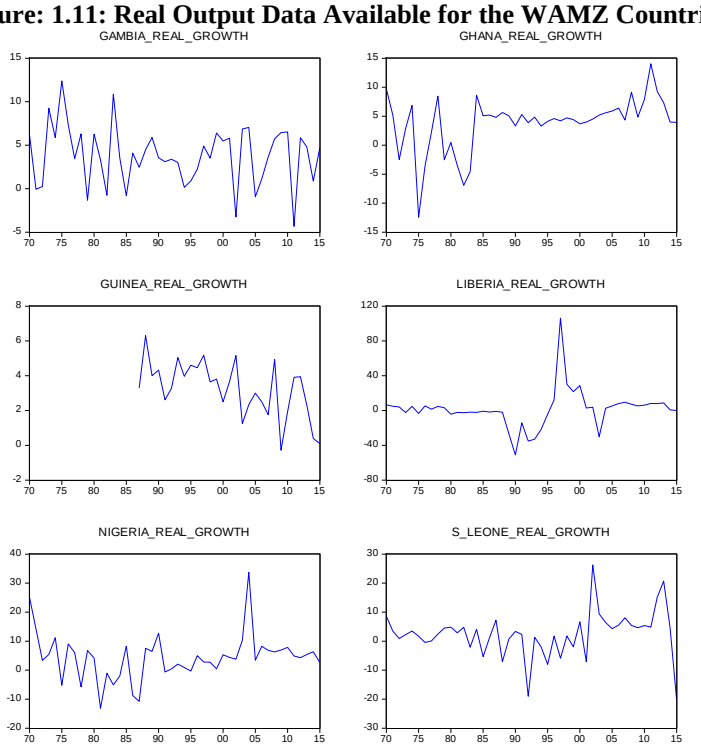


Figure: 1.12: International Reserves Data Available for the WAMZ Countries

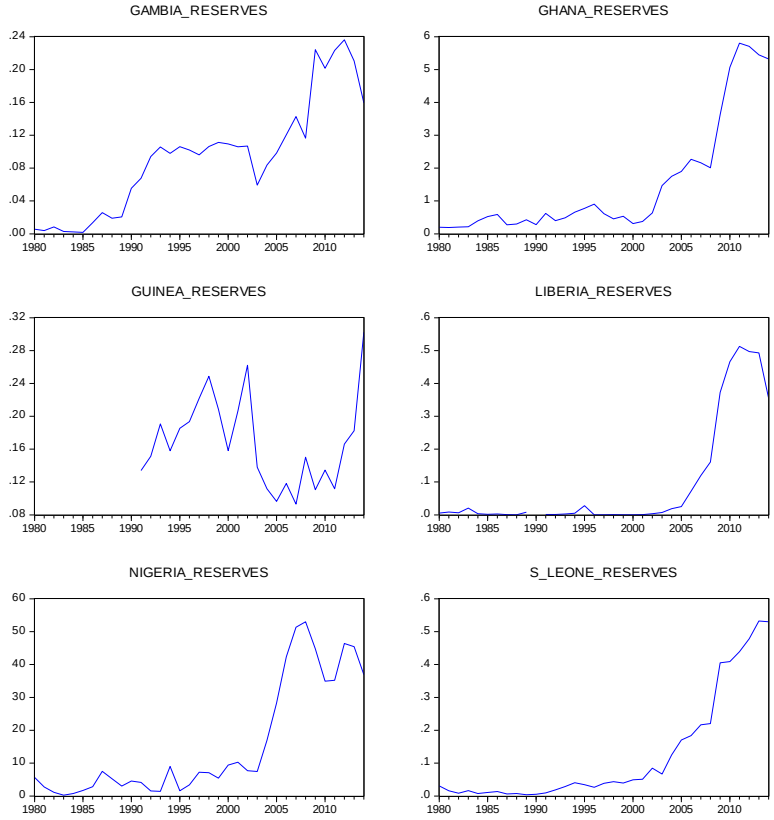


Figure: 1.13: Money Supply (Base Money) Data Available for the WAMZ Countries

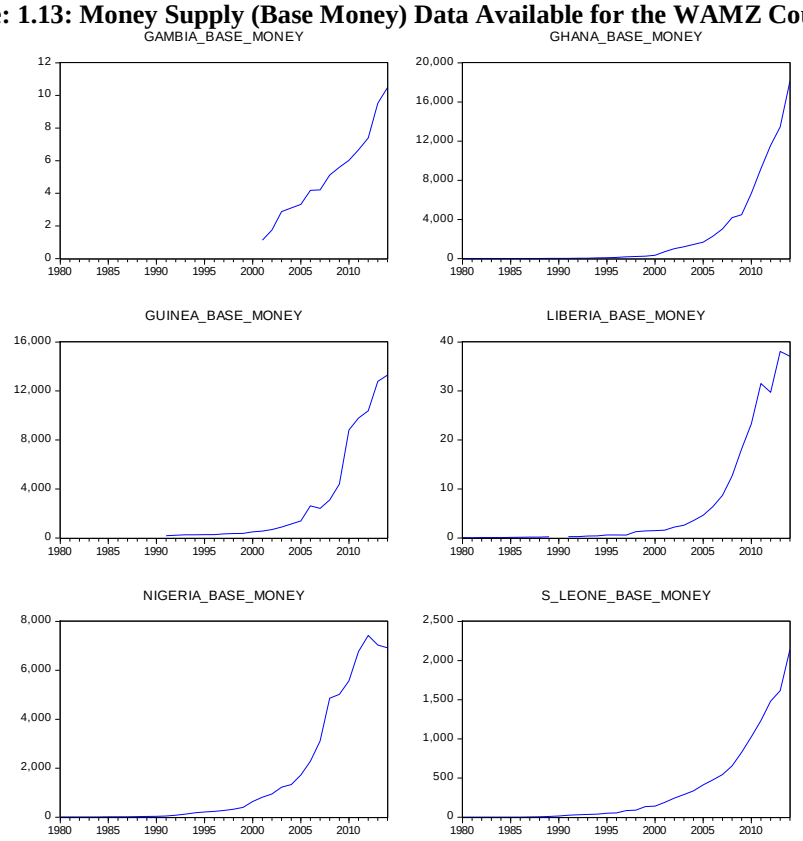


Figure: 1.14: Money Supply (Quasi Money) Data Available for the WAMZ Countries

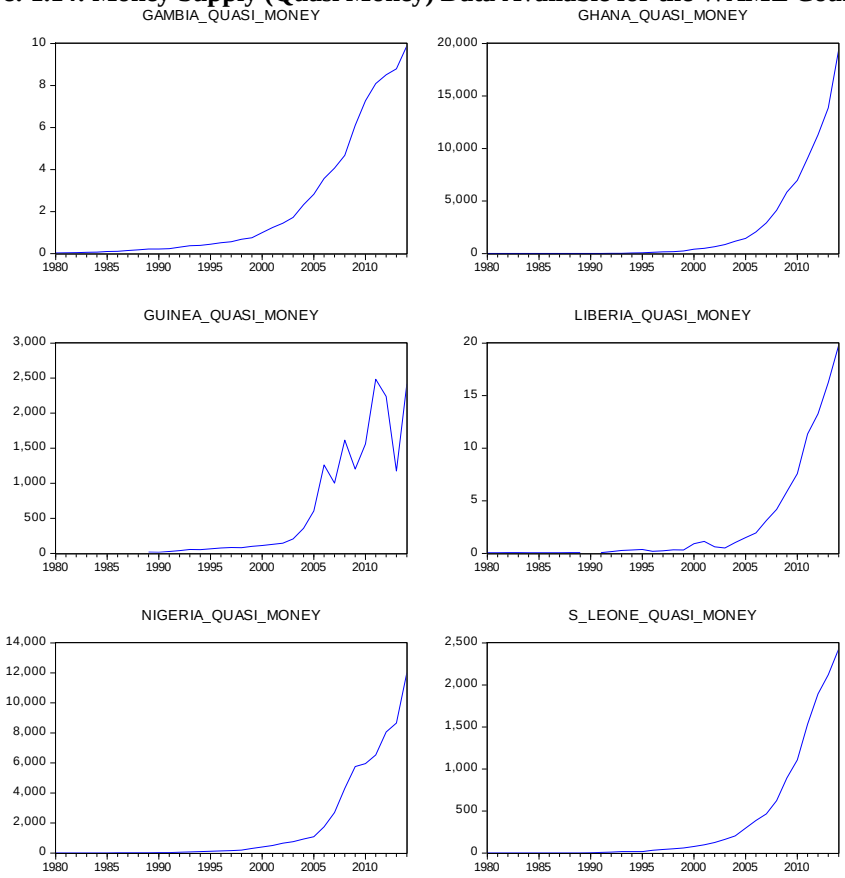


Figure: 1.15: Government Expenditure/GDP Ratio Data Available for the WAMZ Countries

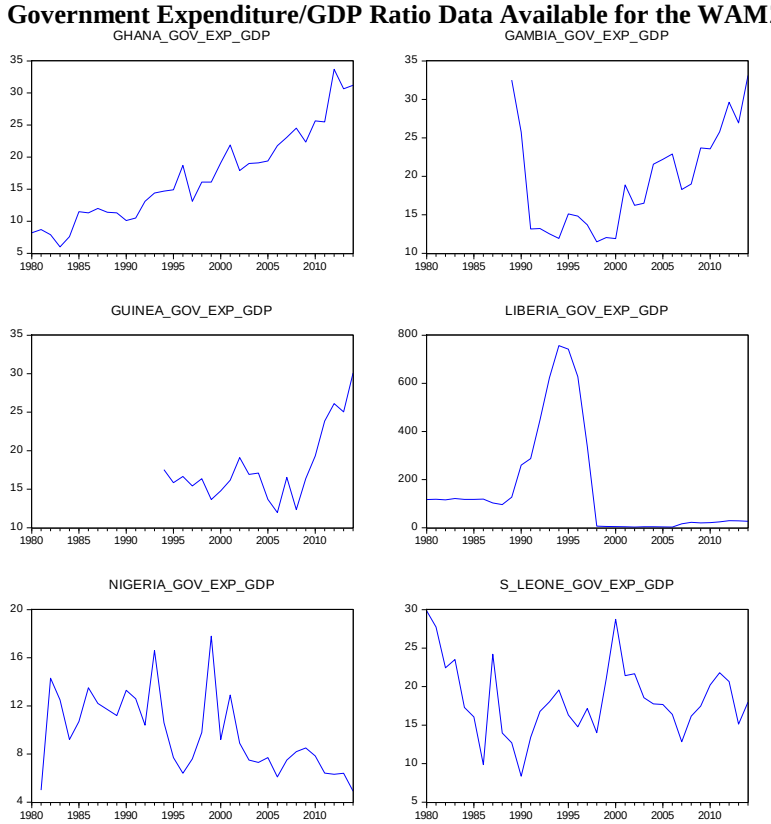


Figure: 1.16: Government Revenue/GDP Ratio Data Available for the WAMZ Countries

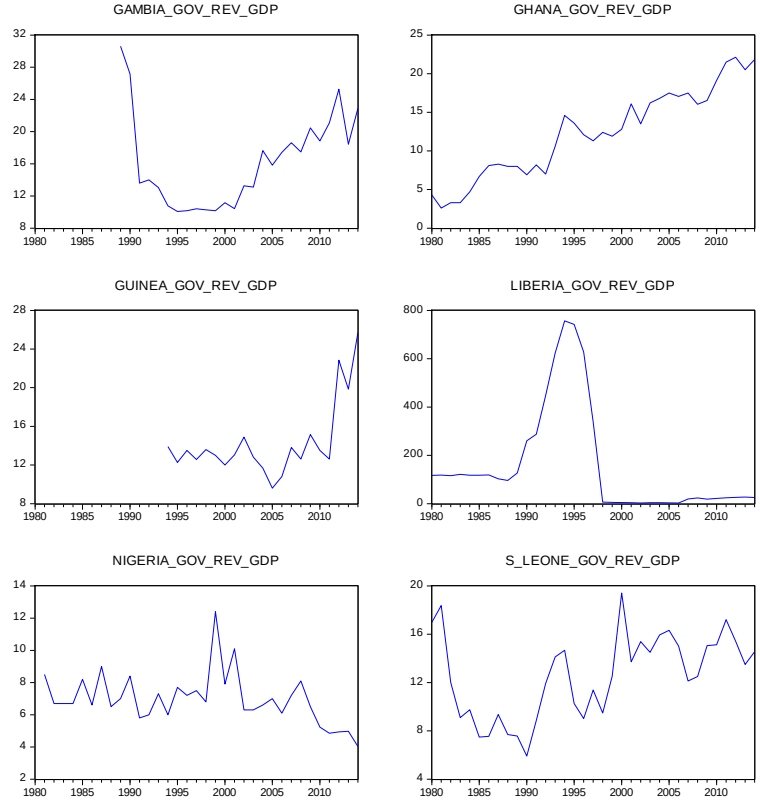


Figure: 1.17: Public Debt/GDP Ratio Data Available for the WAMZ Countries

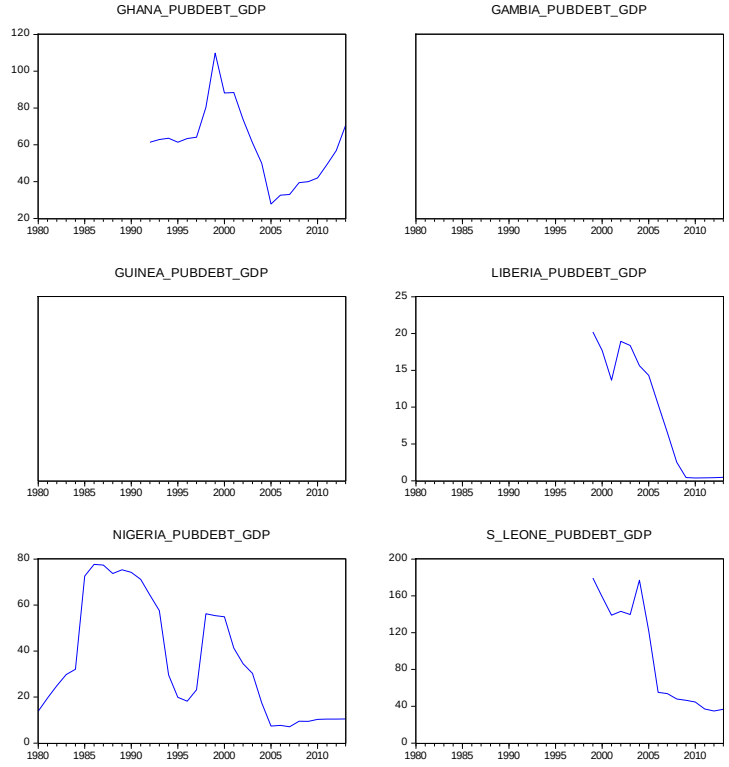


Figure: 1.18: Government Expenditure Data Available for the WAMZ Countries

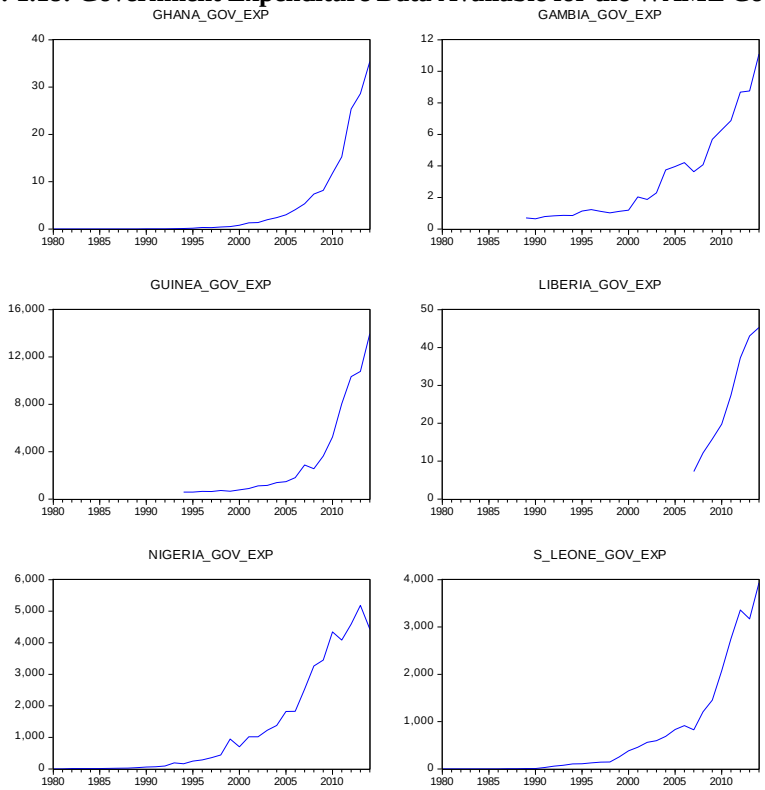


Figure: 1.19: Government Revenue Data Available for the WAMZ Countries

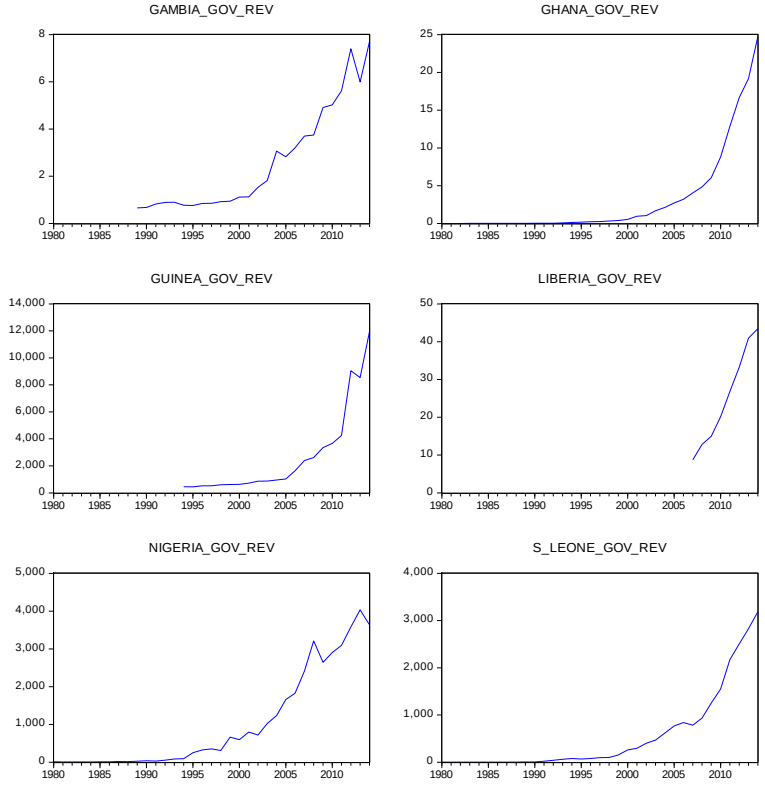


Figure: 1.20: Public Debt Data Available for the WAMZ Countries

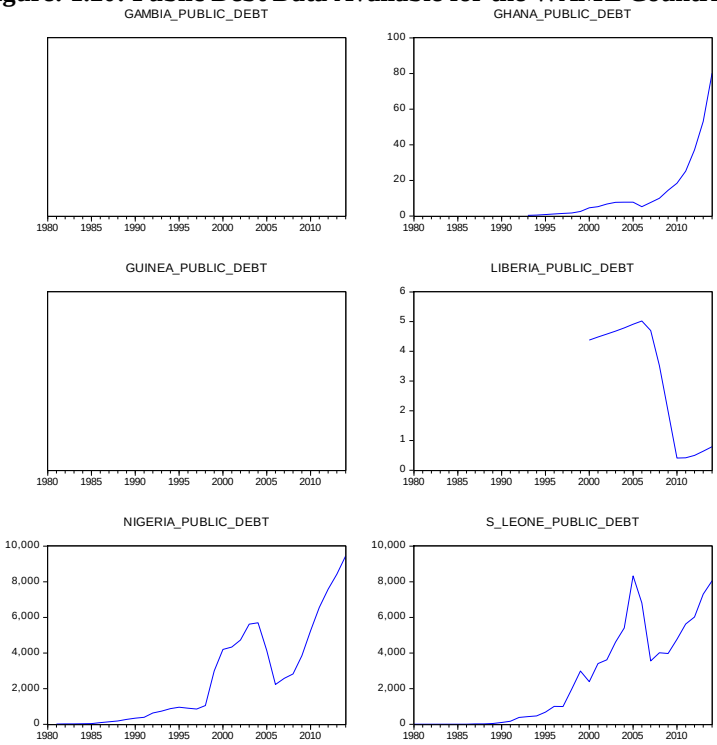


Figure: 1.21: Money Market Interest Rate Data Available for the WAMZ Countries

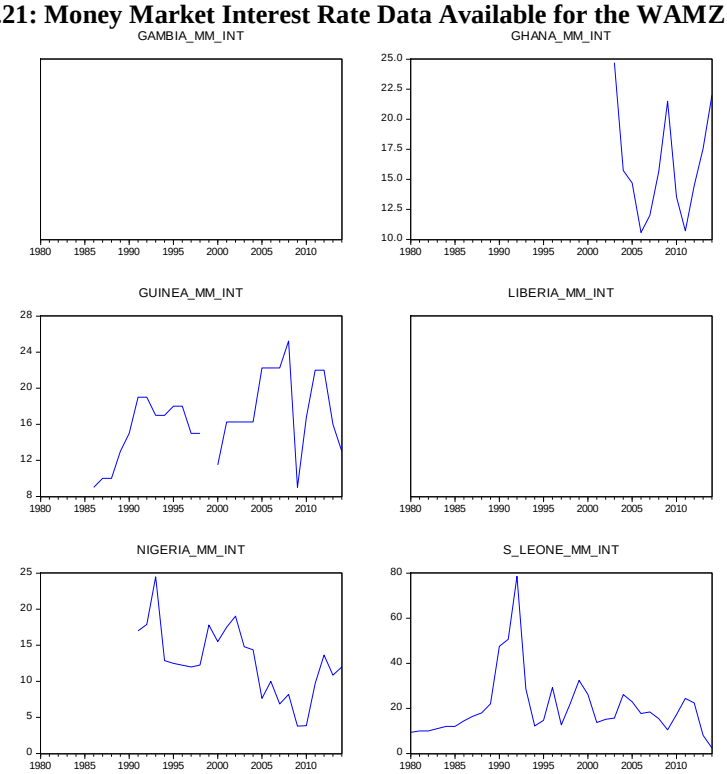


Figure: 1.22: Deposit Interest Rate Data Available for the WAMZ Countries

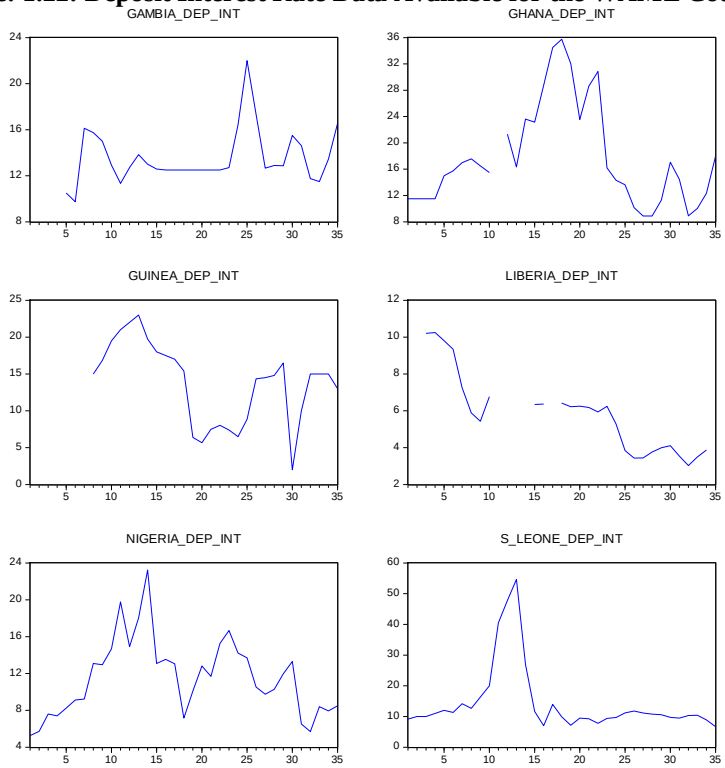
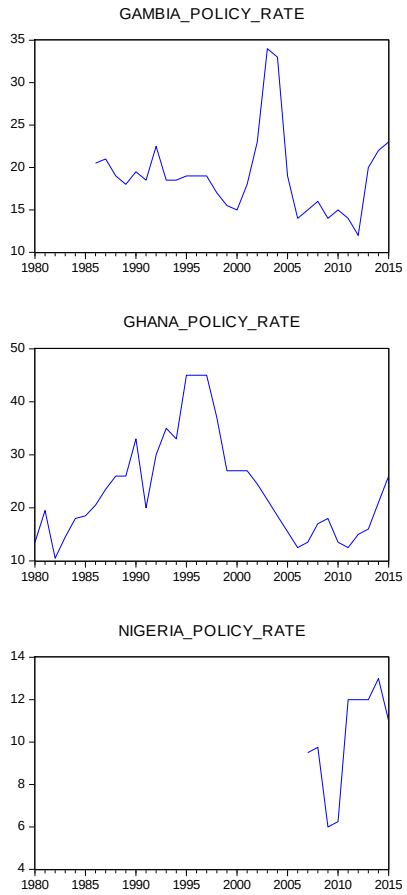


Figure: 1.23: Policy Interest Rate Data Available for the WAMZ Countries



APPENDIX 3.1

Results of ADF and PP Unit Roots Tests of Cross Exchange Rates

		ADF		PP	
Home Country	***Foreign Country***	*With Constant*	*With Constant & Trend*	*With Constant*	*With Constant & Trend*
GAMBIA	***Ghana***	-4.253	-4.192*	-4.871*	-3.867**
	Guinea	-1.280	-3.034	-1.359	-2.115
	Liberia	-1.813	-2.275	-1.698	-2.308
	Nigeria	-2.031	-2.012	-2.051	-2.079
	S/Leone	-3.536*	-3.429***	-3.004**	-2.728
GHANA	***Gambia***	0.274	-1.499	-0.796	-0.857
	Guinea	-1.185	-1.018	-1.185	-1.018
	Liberia	-1.478	-0.401	1.309	-0.635
	Nigeria	-0.006	-1.128	-0.206	-1.447
	S/Leone	-0.073	-1.666	-0.399	-1.540
GUINEA	***Gambia***	-1.093	-1.535	-1.209	-1.768
	Ghana	-1.765	-1.517	-1.483	-1.421
	Liberia	-1.204	-1.484	-1.271	-1.484
	Nigeria	-1.655	-2.044	-1.396	-1.481
	S/Leone	-1.986	-1.987	-1.851	-1.609
LIBERIA	***Gambia***	-1.698	-2.009	-1.572	-1.826
	Ghana	-7.720*	-6.356	-6.441*	-3.621**
	Guinea	-1.850	-2.783	-1.187	-1.864
	Nigeria	-1.800	-1.659	-1.775	-1.573
	S/Leone	-2.681***	-2.584	-3.456*	-2.428
NIGERIA	***Gambia***	-2.085	-1.988	-2.248	-2.173
	Ghana	-2.459	-3.840***	-2.460	-3.084
	Guinea	-1.683	-1.075	-1.182	-1.198
	Liberia	-1.932	-1.913	-1.899	-1.925
	S/Leone	-2.150	-2.126	-2.211	-2.189
SIERRA	***Gambia***	-2.730***	-2.698	-2.436	-2.372
	Ghana	-1.802	-3.087	-1.539	-2.499
	Guinea	-2.213	-1.330	-2.180	-1.608
	Liberia	-1.846	-3.952**	-1.794	-2.664
	Nigeria	-2.577	-2.711	-2.771***	-2.920

Source: Author's Estimations and EViews 10

APPENDIX 3.2

Results of ADF and PP Unit Roots Tests of Absolute PPP Term (P-P*)

		ADF		PP	
Home Country	***Foreign Country***	*With Constant*	*With Constant & Trend*	*With Constant*	*With Constant & Trend*
GAMBIA	***Ghana***	-2.704*	-4.723*	-11.524*	-9.780*
	Guinea	-7.200*	-5.171*	-5.688	-2.556
	Liberia	-0.498	-3.913***	-1.402	-2.453
	Nigeria	-3.518*	-7.093*	-8.940	-20.828*
	S/Leone	-1.824	-0.041	-3.792	-1.777
GHANA	***Gambia***	0.995	-2.782	1.268	-2.053
	Guinea	-4.579	-3.143	-3.257**	-1.694
	Liberia	-0.395	-3.311***	0.715	-3.549**
	Nigeria	-0.968	-1.400	-0.505	-2.040
	S/Leone	0.373	-3.228***	1.194	-0.835
GUINEA	***Gambia***	-2.108	-1.496	-1.793	-0.869
	Ghana	-3.049	-1.912	-2.426	-1.125
	Liberia	-1.870	-3.444***	-1.943	-1.551
	Nigeria	-2.898***	-1.350	-2.629***	-1.492
	S/Leone	-0.590	2.165	1.758	-2.161
LIBERIA	***Gambia***	-0.190	-3.255	-0.715	-2.511
	Ghana	-1.845	-4.092**	-0.653	-2.957
	Guinea	-3.312**	-1.827	-3.427	-1.815
	Nigeria	-1.605	-2.814	-1.406	-2.837
	S/Leone	-1.658	-3.329*	-1.577	-3.545**
NIGERIA	***Gambia***	-1.735	-3.079	-1.678	-3.133
	Ghana	-2.595**	1.773	-1.043	-1.524
	Guinea	-4.697*	-3.051	-4.489*	-2.307
	Liberia	-1.564	-2.852	-1.369	-2.880
	S/Leone	-3.471	-0.489	0.281	-2.541
SIERRA	***Gambia***	-1.712	-0.149	-3.389**	
	Ghana	-0.930	-5.532	-0.338	-1.815*
	Guinea	-1.156	-0.904	-3.525**	-4.184
	Liberia	-2.135	-3.594	-1.866	-3.269***
	Nigeria	-4.247	-0.796	0.241	-2.126

Source: Author's Estimations and EViews 10

APPENDIX 3.3

Results of ADF and PP Unit Roots Tests of Real Exchange Rates

		ADF		*PP*	
Home Country	***Foreign Country***	*With Constant*	*With Constant & Trend*	*With Constant*	*With Constant & Trend*
GAMBIA	***Ghana***	-8.059*	-4.493*	-15.018*	11.576*
	Guinea	-6.448*	-4.457*	-7.897*	-5.285*
	Liberia	-1.847	-3.468***	-1.881	-2.190
	Nigeria	-7.032*	-5.886*	-6.948*	-5.816*
	S/Leone	-2.554	-2.459	-2.306	-2.010
GHANA	***Gambia***	3.441	2.108	4.033	2.173
	Guinea	-3.918*	-4.564*	-2.519	-2.308
	Liberia	2.876	0.395	3.017	0.305
	Nigeria	0.743		1.485	-0.511
	S/Leone	0.473	1.935	0.872	-1.059
GUINEA	***Gambia***	-1.847	-1.499	-1.824	-1.648
	Ghana	-2.414	-2.525	-1.908	-1.837
	Liberia	-2.086	-1.527	2.060	-1.527
	Nigeria	-2.523	-2.342	-2.337	-1.555
	S/Leone	-1.785	-2.492	-2.028	-2.103
LIBERIA	***Gambia***	-1.863	-2.069	-1.951	-2.158
	Ghana	-1.658	-5.991*	-0.243	-3.704**
	Guinea	-4.940*	-3.420**	-5.035*	-3.457**
	Nigeria	-2.805**	-3.221**	-2.850*	-3.282***
	S/Leone	-3.313**	3.416**	-2.181	-2.193
NIGERIA	***Gambia***	-1.585	-2.175	-1.619	-2.295
	Ghana	-2.390	-3.900**	-2.357	-3.076
	Guinea	-6.589*	-8.228*	-7.269*	-4.932*
	Liberia	-3.044**	-3.380**	-3.032***	-3.435***
	S/Leone	-2.871***	4.800**	1.950	-2.401
SIERRA	***Gambia***	-2.361	-2.312	-2.050	-1.950
	Ghana	-1.334	-2.973	-0.580	-1.908
	Guinea	-2.221	-3.614**	2.815***	-3.498***
	Liberia	-3.458**	3.540**	-2.156	-2.101
	Nigeria	-2.743**	3.894**	-1.966	-2.401

Source: Author's Estimations and EViews 10

APPENDIX 3.4

Results of ADF Unit Roots Tests (Exchange Rates Changes/CPI Differentials and IFE Terms)

		Exchange Rate		CPI Differentials		IFE Terms	
Home Country	***Foreign Country***	*With Constant*	*With Constant & Trend*	*With Constant*	*With Constant & Trend*	*With Constant*	*With Constant & Trend*
GAMBIA	***Ghana***	-5.700*	-5.704*	-2.396	-2.584	-2.358	-2.660
	Guinea	-6.366*	-6.305*	-4.524*	-6.149*	-2.022	-1.665
	Liberia	-4.880*	-5.022*	-3.119**	-3.157***	-0.683	-2.308
	Nigeria	-8.426*	-8.392*	-6.038*	-6.303*	-2.324	-2.756
	S/Leone	-6.266*	-2.666*	-3.708*	-3.637**	1.801	1.435
	US	-6.000*	-5.972*				
GHANA	***Gambia***	-5.712*	-5.712*	-2.396	-2.584	-2.223	-3.062
	Guinea	-6.042*	-6.153*	-4.912*	-5.845*	-1.837	-0.185
	Liberia	7.262*	-7.345*	-4.054*	-3.050*	-2.887**	-3.222***
	Nigeria	-6.896*	-6.860*	-8.717*	-8.822*	-3.662*	-3.636
	S/Leone	-5.375*	-5.337*	-2.243	-2.204	0.511	0.100
	US	4.054*	-4.110*				
GUINEA	***Gambia***	-5.819*	-5.768*	-4.524*	-6.149*	-0.705	-0.496
	Ghana	-5.249*	-5.409*	-4.912*	-5.845*	-1.992	-1.866
	Liberia	-7.429*	-7.468*	-6.925*	-7.756*	-1.535	-0.441
	Nigeria	-5.602*	-5.708*	-4.651*	-5.613*	-2.900**	-2.945
	S/Leone	-5.617*	-5.767*	-2.022	-2.157	-2.631***	-3.693**
	US	-5.991*	-6.141*				
LIBERIA	***Gambia***	-5.344*	-5.401*	-3.119**	-3.157***	-0.753	-1.806
	Ghana	-5.154*	-5.318*	-4.054*	-3.051	-2.087	-2.192
	Guinea	-7.238*	-7.192*	-6.925*	-7.756*	-2.527	-1.346
	Nigeria	-8.599*	-8.590*	-7.467	-7.399*	-4.146*	-4.352*
	S/Leone	-2.406	-2.314*	-3.048**	-3.224***	-0.401	-0.378
	US	-5.687*	-5.717*				
NIGERIA	***Gambia***	-9.060*	-9.074*	-6.038*	-6.030*	-1.779	-2.120
	Ghana	-8.829*	-8.820*	-8.717*	-8.822*	-4.036*	-4.076*
	Guinea	-6.223*	-6.283*	-4.651*	-5.613*	-1.450	-1.075
	Liberia	-8.983*	-9.038*	-7.467*	-7.399*	-2.617***	-2.964
	S/Leone	-9.031*	-9.015*	-3.693*	-3.057	-0.928	1.378
	US	-9.056*	-9.086*				
SIERRA	***Gambia***	-5.935*	-5.963*	-3.708*	-3.637**	-2.781***	-3.060
	Ghana	-5.704*	-5.673*	-2.243	-2.204	-3.051**	-2.955
	Guinea	-6.156*	-6.235*	-2.022	-2.158	-1.755	-2.358
	Liberia	-2.159	-6.182*	-3.048**	-3.224***	-1.802	-1.493
	Nigeria	-7.495*	-7.480*	-3.693*	-3.057	-2.410	-2.320
	US	-6.419*	-6.714*				

Source: Author's Estimations and EViews 10 Output

APPENDIX 3.5

Trends of Exchange Rate Regimes in the WAMZ

Historical developments of foreign exchange markets and regimes within which the six WAMZ countries operated over the years are discussed in the following paragraphs.

The Gambia: The currency of The Gambia is *dalasi*, subdivided into 100 units of *bututs*. The currency was adopted in 1971 to replace The Gambian *pound*. For thirty years up till 1985, fixed exchange rate regime prevailed in The Gambia when the currency was pegged to the British *pound*. In 1986, interbank floating exchange rate system was however introduced when the Structural Adjustment Programme (SAP) was adopted with a consequential effect of depreciation of dalasi in 1987. By April 1990, foreign exchange bureau were introduced towards strengthening the foreign exchange market. Thereafter, the emergence of interbank foreign exchange market led to reduced premium of prevailing exchange rates of these two established foreign exchange market; while in September 2003, competition in the market became stiffer when more non-bank foreign exchange dealers were licensed and the operations of the parallel markets were halted. There was relative stability of *dalasi* in the 1990s. However, the currency witnessed series of depreciation against the US *dollar* between 2000 and 2003, but showed appreciation up till 2007. Nevertheless, the depreciation of *dalasi* had been sluggish since 2008, till the present days.

Ghana: The first Ghanaian currency, *cedi*, came into effect in 1965 when it replaced the Ghanaian pound. Up till 1982, Ghana foreign exchange market operated under the fixed exchange rate regime. Between 1983 and 1986, there were series of devaluations (of cedi) under the Ghanaian government's Economic Reform Programme (ERP) in which a fixed exchange rate was maintained in spite of the periodic devaluation that saw *cedi* devalued by up to 96.9%. These quarterly devaluation were in stages within this period. In December

1984, the Bank of Ghana switched to a system of periodic adjustment mechanism because at then, *cedi* was highly overvalued. However, up till the early 1980s, cedi was relatively stable. The Ghanaian government established a foreign exchange auction market in which there were dual exchange rates of two windows even while leaving the determination of the exchange rate partially to market forces of demand and supply in the second phase of the ERP between 1987 and 1989. The government placed control over the exchange rate for 'vital transactions' in what was called 'Window One Transactions' which operated within a fixed exchange rate system, purposely for transactions in cocoa exports, crude oil transactions, government debt servicing and pharmaceuticals. Simultaneously, the foreign exchange auction system controlled by the Bank of Ghana was introduced for 'Window Two Transactions' in weekly auction for all other transactions involving 'priority areas of the economy'.

Under the ERPII (1987-1989), there were two-tier exchange rate markets operating in Ghana. Foreign Exchange Bureaux were established in 1988 so as to incorporate parallel foreign exchange market into the system. These were established in all major cities of Ghana to channel foreign exchange transaction of the black market through the banking system. The implication of this was that the Ghanaian foreign exchange market had two rates. The two windows exchange rate markets were unified in early 1987 yielding the Dual Retail Auction (DRA) and the Dutch Auction (DA). The DRA operated the marginal pricing mechanism in which successful bidder were to pay the marginal price while in the DA successful bidders paid the bid price. There were modifications to the Auction system in the first quarter of 1990. The wholesale auction was introduced as replacement for the retail auction. The exchange rates (against major currencies) were determined in an interbank foreign exchange market adopting the weekly whole sale auction system. In April 1992, the wholesale auction system was replaced by the interbank foreign exchange market in which banks as authorised

dealers; and foreign exchange bureau have since operated in this competitive environment in which the selling and the buying of foreign exchange were determined by commercial banks average daily retail exchange rate. The pace of depreciation of *cedi* became slow between 2001 and 2007. On 3 July, 2007 the Ghanaian cedi was redenominated as 1 new *cedi* (Ghanaian cedi) to 10,000 old *cedi*. Following this, between 2008 and 2009, the external values of *cedi* fell sharply. This decline in value was attributed to the redenomination exercise.

Guinea: The Guinean currency adopted on independence in 1958 was Guinean *syli*, pegged to the Special Drawing Rights (SDR) on 11 June 1975, under a fixed exchange rate regime. Due to increased overvaluation of this currency which created a gap with the parallel market rate, a second foreign exchange market was created in October 1985 with the main purpose of attracting foreign exchange to the official channels. A new currency, the Guinean *franc* replaced the Guinean *syli* in 1986. As at this time, exchange rates were set during the central bank's weekly foreign exchange auctions. A flexible exchange rate regime was introduced in October 1994 as well as an interbank foreign exchange market. This caused series of depreciation in the Guinea franc between 1997 and 2000. The weekly auction system was replaced by monthly auction system between 2000 and 2002 due to foreign exchange shortages in the official circles. The Guinean currency was pegged to the US dollars between late 2002 and July 2004 and this led to the appreciation of the Guinean *franc*. The auction was in 2005 abandoned in a foreign exchange market liberalisation initiative of the government. Since then, the official exchange rate has been determined by weekly estimation of an arithmetic averages of deposit banks and non-bank authorised bureau de change (as the reference rate). Although, the currency experienced depreciation in 2010, there were series of appreciation in 2007 and 2009 and related stability up till the present days.

Liberia: Since independence in 1847, the Liberian economy has been wholly dollarised. There had been intensive use of foreign currencies within the economy. The tie between the country and the US and British West African Colonies greatly dictated the country's choice of currency. The 'Doe *dollars*', the 'JJ Roberts *dollars*' and the 'Liberty *dollars*' were different Liberian *dollars* minted between the 1980s, through the civil war until the end of the last century. JJ Roberts notes and the Liberty notes were in circulation during the civil war period between 1989 and 1997, when the JJ Roberts *dollar* notes was made at par with the US *dollar*. Since this devaluation, Liberian currency have been witnessing an average 5% annual devaluation so as to be in tune with inflation differential between the country and the US. Between 1981 and 1997, Liberia operated fixed exchange rate regime in which the Liberian *dollar* was pegged to the US dollar at fixed parity. The country abandoned the exchange rate peg in January 1998 and operated free floating exchange rate regime (since 1998) when the country's US *dollar* exchange rate was devalued from L$1=US$1 to L$43=US$1. This caused the exchange rate to witness depreciation significantly in 1998, but appreciated thereafter when a managed floating exchange rate regime was adopted in 2000. There had been relative stability in the value of the Liberian *dollar* between in the last ten years.

Nigeria: The currency of Nigeria is *naira* which was introduced on 1 January 1973 when it replaced the Nigerian pound which served as the country's currency between 1907 and 1973. Nigeria used the British West African pound until 1958. The Nigerian pound was at parity with the British pound, having easy convertibility. As at the introduction of naira in 1973, the exchange rate was two pounds to one naira. Nigeria operated fixed exchange rate regime (pegging of her currency to major international currencies) from her independence in 1960 up to 1986. The fixed exchange rate policy was implemented by applying different systems according to the state of the country's economy. Under this regime, parity (determined by the gold content of the Nigerian *pound*) was maintained with pound sterling until when the

Nigerian pound ceased to exist at the close of 1972. There was a change of the Nigerian pound gold content to US *dollar* between 1971 and 1974 in response to the international monetary system crisis in which the convertibility of US *dollar* into gold was suspended. The import-weighted basket approach was adopted in 1978. The Nigerian foreign exchange market had since, witnessed tremendous changes. In 1986, following the introduction of the Structural Adjustment Programme (SAP), the Second-tier Foreign Exchange Market (SFEM) was introduced and naira was floated under the adopted dual exchange rate system for the allocation of foreign exchange. Under this system, transitional items (like debt services payments and official transfers) were settled at the first-tier exchange rate. In 1989 there was official recognition granted the parallel market for foreign exchange (which has been in existence since the exchange control era which started in 1962) when the Bureaux de Change (BDCs) were licensed to accord access to small users of foreign exchange and enlarge the officially recognised foreign exchange market. Exchange rates in the BDCs are market determined. In 1994, due to volatility in exchange rates, further reforms were introduced in the market. Some of these reforms are: formal pegging of the naira exchange rate, the centralisation of foreign exchange in the Central Bank of Nigeria (CBN), the restriction of Bureaux de Change to buy foreign exchange as agents of the CBN, the reaffirmation of the illegality of the parallel market and the discontinuation of open accounts and bills for collection as means of payments. In 1995, the Autonomous Foreign Exchange Market (AFEM) was introduced to liberalise the market and redress market distortions. The AFEM was for the purpose of selling foreign exchange to end-users by the CBN through selected authorised dealers at market determined exchange rate. Bureaux de Change were also accorded the status of authorised buyers and sellers of foreign exchange. The AFEM (which operated alongside the fixed official market window) catered for the foreign currency needs of private economic agents. Exchange rate was relatively stable under this system. To further

liberalise the market, there was transition from AFEM to Interbank Foreign Exchange Market (IFEM) on October 25, 1999. Under this regime, the Central Bank of Nigeria (CBN) served was the major source of foreign exchange which authorised dealers could purchase on behalf of their customers at a rate determined by the CBN. IFEM was meant to broaden and deepen the foreign exchange market daily and also to discourage speculative activities. Nevertheless, this system led to exchange rate instability with the worst record of depreciation of 77.7%. In 2002, the Dutch Auction System (DAS) was introduced to deepen the market and this caused the naira to appreciate between 2004 and 2007. There were Retail Dutch Auction System (RDAS) and Wholesale Dutch Auction System (WDAS) options under this regime. RDAS was adopted till February 2006. The CBN participated to sell foreign exchange under the WDAS option from February 2006 till October 2013 when RDAS was reintroduced. The strategy under the WDAS was to ensure increased restriction of access to official market in order to reduce the demand pressure being exerted on the parallel market. The end goal here was to facilitate a convergence between official and parallel markets so as to achieve a single exchange rate for the naira. The IFEM was however reintroduced in February 2015.

Sierra Leone: The currency of Sierra Leone, the *leone* came into existence on 4 August, 1964 when it replaced the British West African Pound. Following the collapse of the Bretton Woods System in the 1970s, Sierra Leone (like many other countries), adopted a fixed exchange rate regime. The country changed to the floating exchange rate regime in 1986 when SAP was introduced and *leone* was revalued. The introduction of the floating regime was towards reducing exchange volatility to the minimum possible level and increase the competitiveness of exports. In order to prevent excessive depreciation of the *leone*, managed floating regime was adopted in April 1991 when the Central Bank of The Gambia (through its periodic regulation of the market) carried out weekly foreign exchange auction. These caused significant depreciation of *leone* between 1986 and 1990. However, between 1991 and 1994, the rate of depreciation of the currency was hugely sluggish and stable, but reflecting declining depreciation till recent times.

APPENDIX 3.6

Banking Systems of the WAMZ Countries

Banking Sector of The Gambia: Banking started in The Gambia over a century ago. The financial system of The Gambia is dominated by commercial banking and majority of the commercial banks are foreign-owned. Commercial banks in The Gambia offer a wide range of financial services. The banking system is sound and prudent given the moderate volume of non-performing loans, though it is not a fully developed banking system. One of the fourteen banks currently operating in The Gambia banking sector is an Islamic banking institution while the other thirteen banks run conventional banking. The Gambian banks are liquid and adequately capitalised as the risk weighted capital adequacy ratio was 27.1% as at the end of 2011. The rapid growth witnessed by The Gambian banking system during the last decade was mainly driven by the inflows of FDI, rigourous competition within the banking system, enhanced financial intermediation and the provision of finance through credits made available to the private sector which grew over the years and stood (as a ratio of GDP) at 15.4 as at the end of 2012. Commercial banks in The Gambia met the minimum reserve requirement. The Central Bank of The Gambia (CBG) is the apex banking institution in The Gambia, having the responsibility to regulate and supervise banks and other related financial institutions in the country. In recent past, the CBG carried out some reforms in the banking sector of The Gambia so as to ensure solvency and large scale financial stability within the banking sector and the economy. As reform initiative, capital requirements of banks were tripled within three years (2010-2012), new payment systems were introduced, Credit Reference Bureau (CRB) was established and on-site banking supervision process was emphasised.

Banking Sector of Ghana**:** The banking system of Ghana which has 26 universal banks and 135 rural and community bank is well developed. Apart from these banks, there are 49 non-banking financial institutions and about 402 and credit unions and cooperatives operating the Ghanaian financial system. The funding strategy of the Ghanaian banking sector has been deposit-based; and due to this, over the past decade, commercial banks' deposits/assets ratio revolved around 63% and 72%. In 2012, a seven-year compound annual growth of banks' total assets and aggregate loans stood at 33.1% and 32.8% respectively. Between 2010 and 2012, there was established improvement in the ratio of non-performing loans demonstrating a drop from 17.6% (in 2010) to 13.2% (in 2012), propelled by prudent risk management that was put in place as well as 'enhanced recovery'.

In the WAMZ, the Ghanaian banking sector is the second largest (after Nigeria) with a total asset of US$14.3billion as at the last quarter of 2013, though this was accompanied by low degree of banking penetration manifested in the banking sector asset/GDP ratio of 49% as at 2013. At 2012 Ghana recorded the highest loan/deposit ratio in the WAMZ at 66.5% from 58.5% in the previous year, 2011. Over the past decade, the Ghanaian banking sector is well capitalised and liquid. The Capital

Adequacy Ratio (CAR) had been above the minimum benchmark of 10%, standing at 18.5% in 2013 (higher than Nigeria's CAR of 18.3 in same year, though below Liberia and Sierra Leone's CAR for the same year. The capital bases of banks in Ghana received the much needed boosts courtesy of the banks' recapitalization exercise that took place between 2009 and 2012. The set minimum capital requirement was met by all the banks. However, it is suffice to state that the entire WAMZ's banking sector is well capitalised as evident by the CAR which are above the set minimum requirement in all the WAMZ countries. Thanks to the consolidation and capital requirement increase initiatives in Ghana, Nigeria and Sierra Leone over the recent years. Between 2005 and 2012, the liquidity of the banking sector in Ghana was swinging between 39% and 55%, but down-trended to 51% in 2012. The sector had in recent time witnessed improved profitability with a 8-year average growth rate of 36.4% as at 2013, while banks' revenue growth had been robust with the contribution of gross revenue standing around 70% in 2012 (and non-interest income contribution at 30%). In 2013, the total assets and deposit of this banking sector grew by 33% and 27% respectively. There had been year-on-year improvement in asset quality of the Ghanaian banking sector which was 12% in 2013.

The apex banking institution in Ghana is Bank of Ghana (BOG) which supervises and regulates the banking sector. BOG which introduced universal banking in 1003 directed all Ghanaian banks to recapitalise between 2009 and 2013.

Banking Sector of Guinea: The banking sector in Guinea dominates the country's financial system. The concentration of banking services in hugely in the capital city Conakry. Currently, there are 13 banks and 6 microfinance institutions which increasingly grant business and agricultural credits to small enterprises due to difficulties of the businesses in accessing commercial bank financing. Domestic banks and subsidiaries of foreign banks have been playing active roles in financial intermediation in Guinea. The Central Bank of the Republic of Guinea (*BanqueCentrale de Republique du Guinee –BCRG*) which regulates and supervises Guinean banks is the apex bank of Guinea. This bank is known to be an active promoter of financial inclusion.[109] This bank recently introduced some reforms tailored towards banking efficiency and ensuring conformity of the financial system to international standards. The bank's reform agenda are in the area of strategies for liquidity management, credit operation and inter-bank foreign exchange dealing as well as the introduction of corporate and new management practices in banking, implementation of accounting ration and rejuvenating of payment systems to conform with/to modern practices. These are probably fruits of lessons learnt from Eurozone crisis in warming up for the take-off WAMZ as a currency union.

[109]Financial inclusion entails delivering financial services to the disadvantages and low-segment of the populace at low and affordable costs.

It is necessary to note that between 2006 and 2010, the central bank was in the practice of financing public budget deficits through the issuance of currency. This practice led to budget explosion, high inflation, poverty, poor management of public finance, high external debt stock, incessant foreign exchange market intervention of the central bank and monetary policy easing, among others. The central bank has been enjoying independence (from government control) since the beginning of 2011.

Banking Sector of Liberia: The financial system of Liberia is dominated by the banking sector which is very small and presently has nine (9) commercial banks which are well capitalised and liquid, but however exhibiting some risk elements owing to the general low level of profitability and high non-performing loans. The degree of financial intermediation is generally low in Liberia, while access to banking finance is limited on the overall. Poor infrastructure is a huge impeding factor in the growth of baking services in Liberia. Apart from these, the entirefinancial system had been susceptible or exposed to various instabilities (economic and political). The Liberian banking sector is dominated by Ecobank and the Liberian Bank for Development and Investment (LBDI). The LBDI has the strongest capacity to face challenges and needs (loans, deposits mobilisation, foreign exchange transactions and remittances, real estate etc) within the Liberian financial system. Over a five-year period till 2012, commercial banks' credits to private sector/GDP ratio in Liberia recorded steady increasing trend from 12% in 2008 to 16% in 2012.

The Central Bank of Liberia is the apex bank in Liberia. The bank is also involved in the promotion of financial inclusion. The apex bank, in recent time, came up with various steps to strengthen the banking sector and improve access to financial sector services and the expansion of intermediation through substantial developments (legal and financial) regulatory framework and corporate governance within the Liberia banking sector. Improvement in banking supervision is evident by the incorporation of semi-annual on-site examination requirement for all commercial banks operating in Liberia. These are right steps in the right direction, against banking sector instability in Liberia.

Banking Sector of Nigeria: The banking sector dominates the Nigerian financial system. Currently, Nigeria has 21 commercial banks (deposit money banks) and many microfinance banks. Many of these big banks have opened branches and subsidiary offices in the regions of Africa (UBA, Access Bank, Guaranty Trust Bank, Zenith Bank and Skye Bank). Banking is the core of the Nigerian financial system in which banks play major role in money and capital markets, accounting for one-third of total equity market capitalisation as at 2011. Four largest banks in Nigeria hold about 60% of total assets as at 2012.[110]The Nigerian banking system is the largest in the WAMZ, reflecting the enormous share of Nigeria's share (over 80%) of the total GDP of the entire WAMZ. There have been many significant reforms in the history of banking in Nigeria. The banking sector had greatly

[110]Thirteen (13) Nigerian banks were included in the 'Top 1000 Banks Index' of The Banker in2014.

successful bank consolidation and recapitalisation exercise in 2005/2006 when the minimum capital requirement of banks was fixed for N25billion (US$160 million) for national banks in Nigeria and this pruned the number of banks in Nigeria down to 25 from 89. The minimum capital requirement for international banks operating in Nigeria and overseas was N100billion (US$640 million).The recapitalisation exercise ushered in increasing credit expansion brought about by widening of banks' activities.

In spite of the success of the consolidation and recapitalisation exercise, the banking sector crisis of 2009 crept into the Nigerian banking system. The banking crisis was caused large scale insider abuse and bad lending decisions, leading to problem loans. The regulatory authorities however responded swiftly to the crisis by applying series of measures which curtailed the crisis. Some of the measures taken by the Central Bank of Nigeria (CBN) were the intervention of ten banks (with eight of these banks had their management replaced), provision of liquidity and capital supports of about US$4.1 billion, introducing new supervisory framework (combination of risk-based supervision and consolidate supervision), among others. The implementation of the International Financial Reporting Standards (IFRS) and those of some of the provisions of the Basel Accord (Basel III) are future measures to take. It is evident that the banking crisis provoked improved banking regulation and supervision (on site and off site) as well and corporate governance practices of high standard. However, on the other hand, the 2005/2006 capitalisation exercise gave some Nigerian banks the motivation and incentive to expand beyond the shores of Nigeria by going international with the establishment of subsidiaries in other regions of Africa. Nigerian commercial banks are now 'common features' in many African banking sectors. The Nigerian banking system has the largest subsidiary of pan-African bank that has its headquarters outside Nigeria. These make the stability of the Nigeria banking sector extremely crucial to the financial stability of the proposed WAMZ and the SSA in general. Nevertheless, according to the IMF (2013), the Nigerian financial system is still vulnerable to global and domestic shocks, even as it has recovered from its domestic banking crisis and that 'most Nigerian banks could withstand extreme shocks' liquidity pressure as a well as 'absorbing moderate potential losses'.

The apex bank in Nigeria banking system is the Central Bank of Nigeria (CBN) which has over the last couple of years taken some steps, decisions and reforms that are decisive in strengthening its oversight functions and ensuring stability of the Nigerian banking sector. The bank has been making efforts to enhance and intensify its cross-border banking supervision with the establishment of a department and framework for this purpose as well as the initiation and execution of bilateral memorandum of understanding on cross-border supervision and cooperation in 2012. Though this is challenging, given some of the possible obstacles, however, it has good implications for the WAMZ as a proposed currency union.

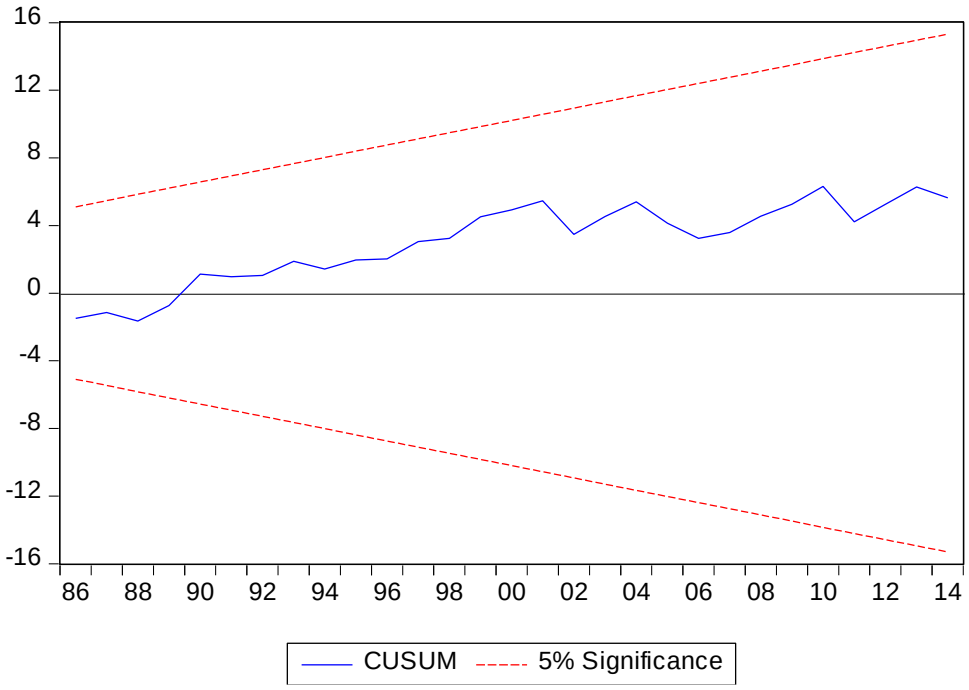
It is necessary to note that Nigeria is the only WAMZ country that has an established body for bank deposit insurance. This body (known as the Nigerian Deposit Insurance Corporation) serves as safety net for the Nigeria banking sector by protecting the banking system from instability that emanates from bank runs and loss of depositors' confidence in the banking system. The major purpose of this body which exercises supervisory role over insured banks is to make the Nigerian banking system secured.

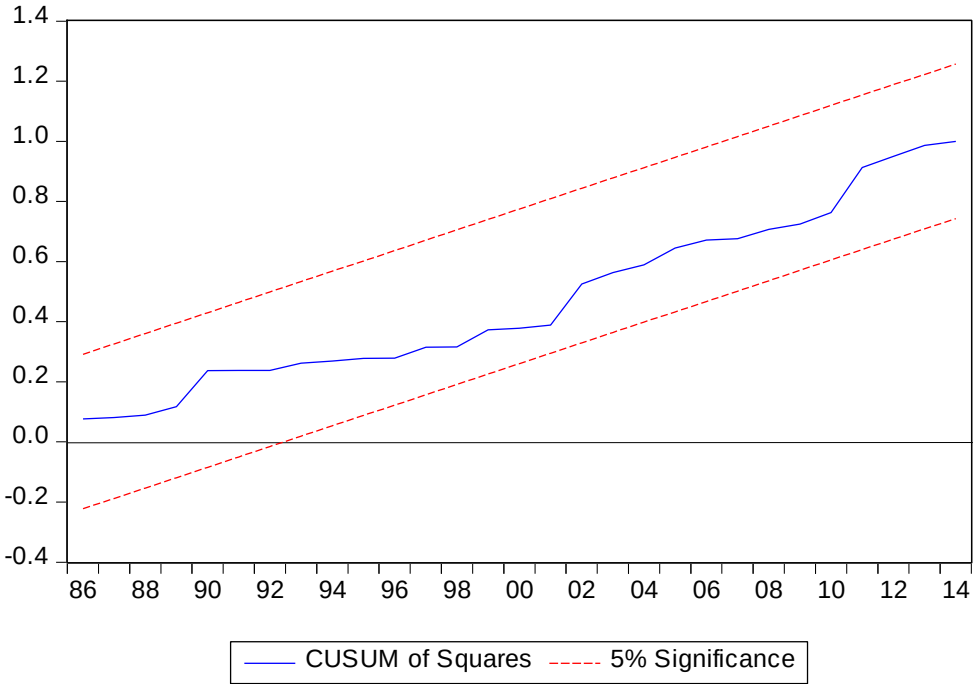
***Banking Sector of Sierra Leone*:** Commercial banks dominate the financial system of Sierra Leone. Currently, there are 12 commercial banks (with huge presence of subsidiaries of Nigerian banks) and other rural and community banks in Sierra Leone. As at the end of 2012, the domestic credit to private sector/GDP ratio stood at a low of 6.2% while the liquid reserve/bank asset ratio was 10.3%. The non-performing loan/total loan ratio declined from 15.6% in 2010 to 14.7% in 2012. Banks in Sierra Leone are adequately capitalised and are profitable (given the growing interest rate spread around 12% and 10% in the last six years.

APPENDIX 5.1

Charts of the CUSUM and CUSUM Square Charts of Parameter Stability in ARDL Estimations of Money Neutrality

Gambia





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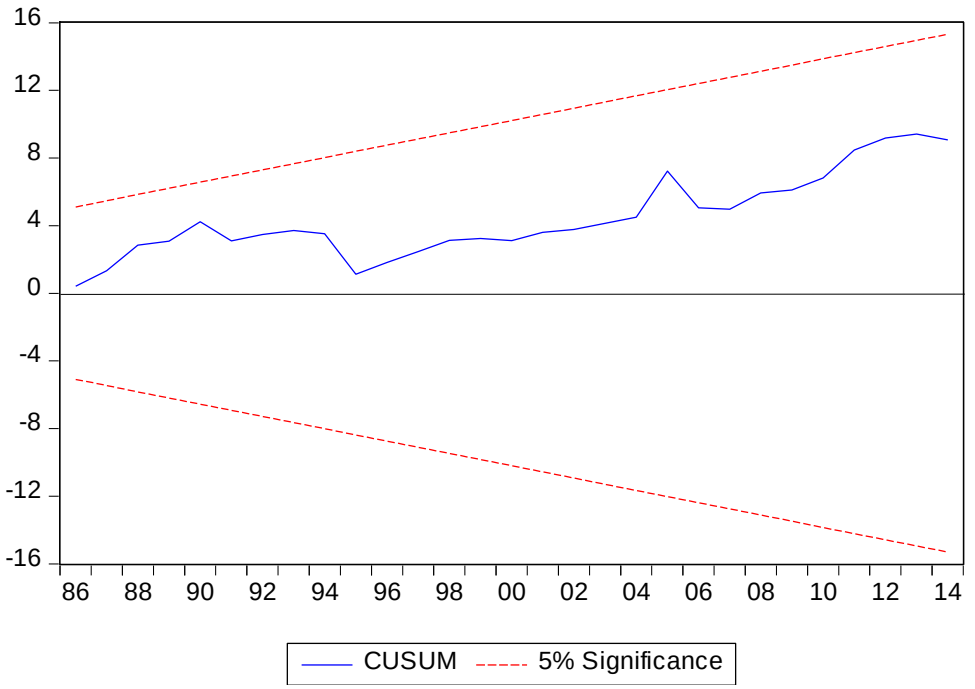
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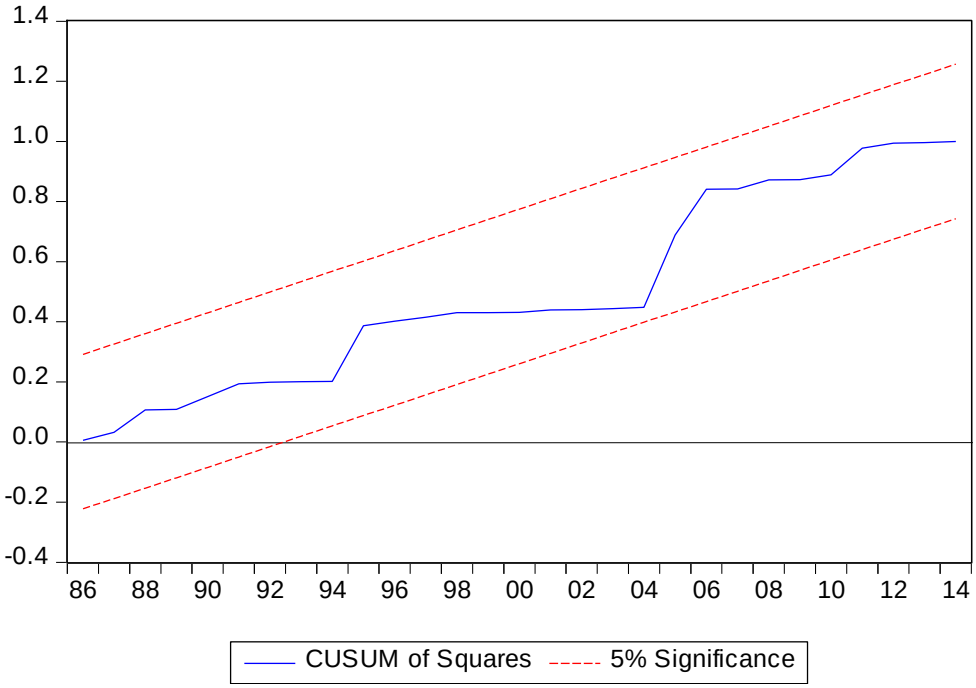
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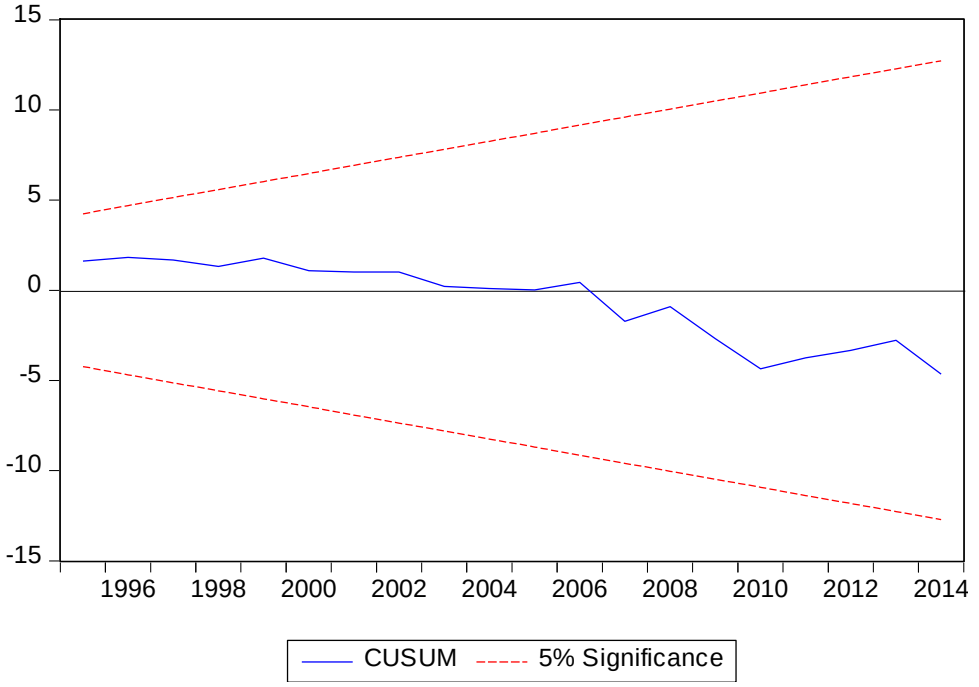
Guinea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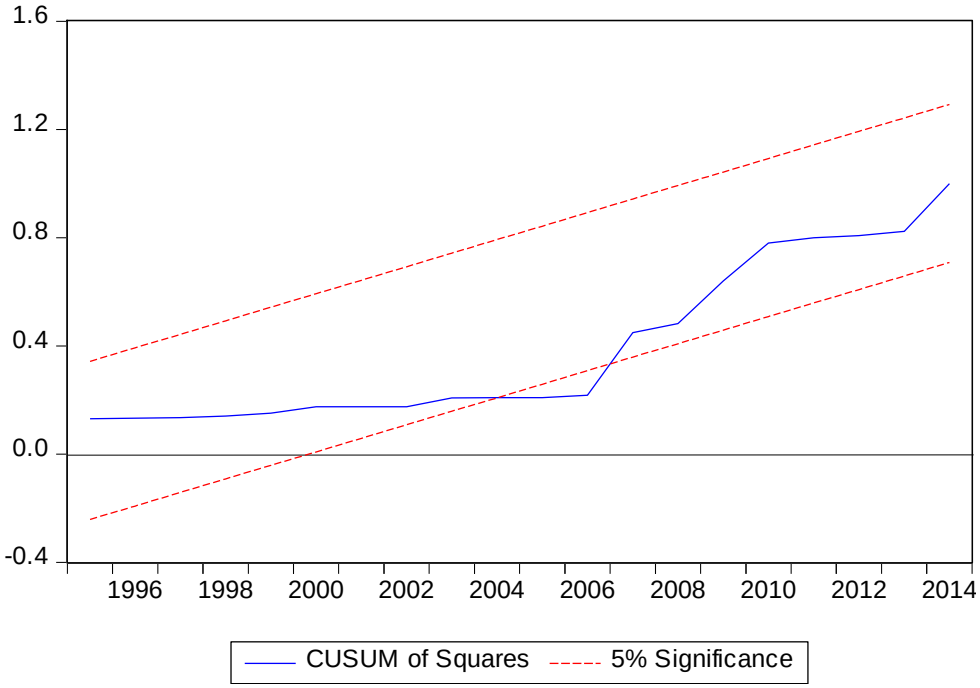
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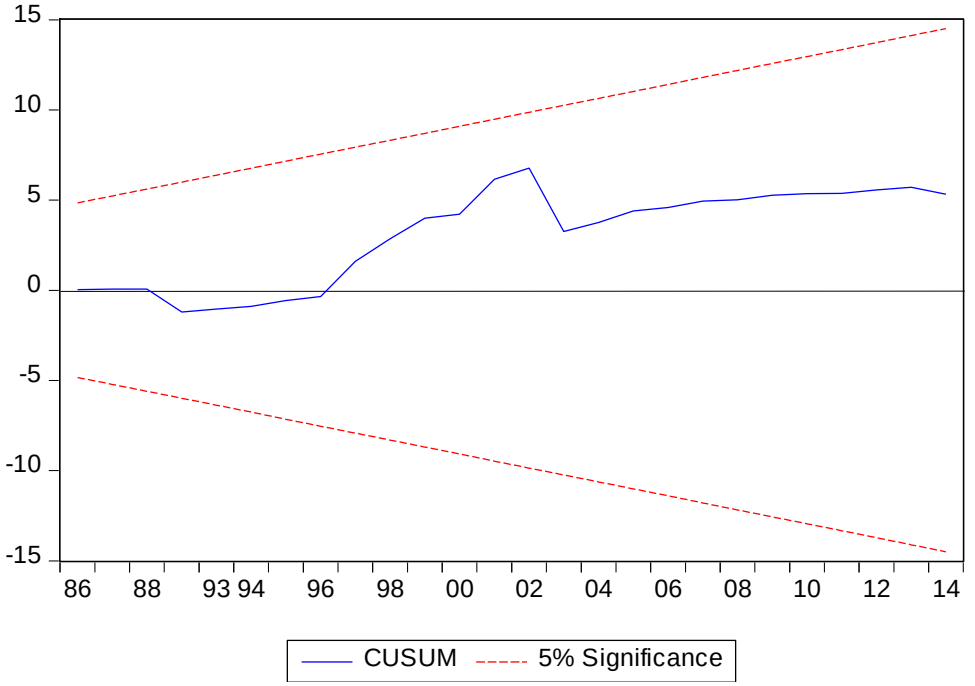
Liberia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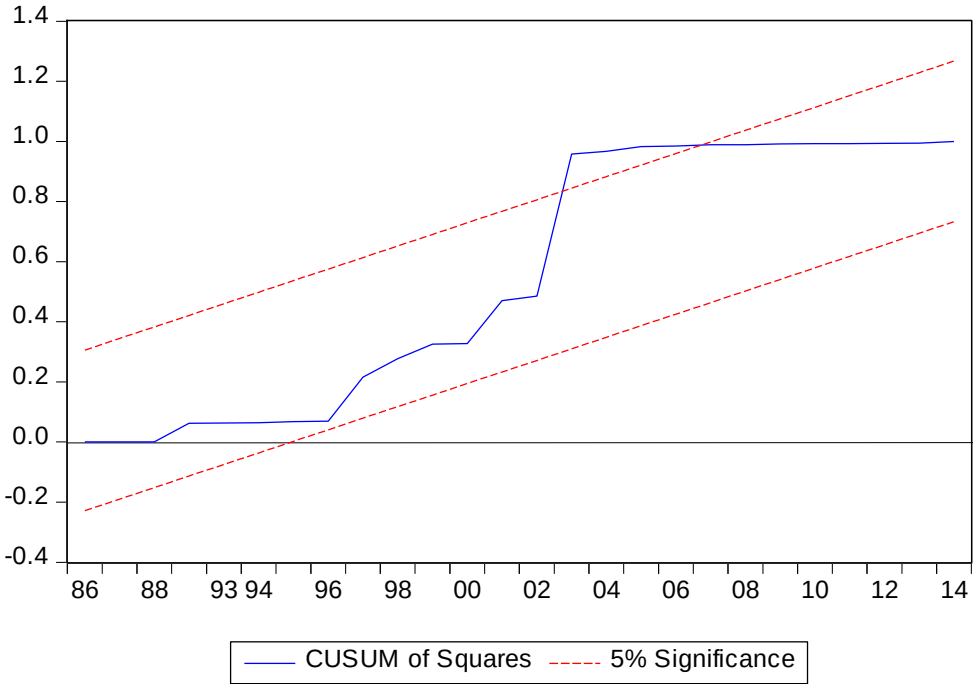
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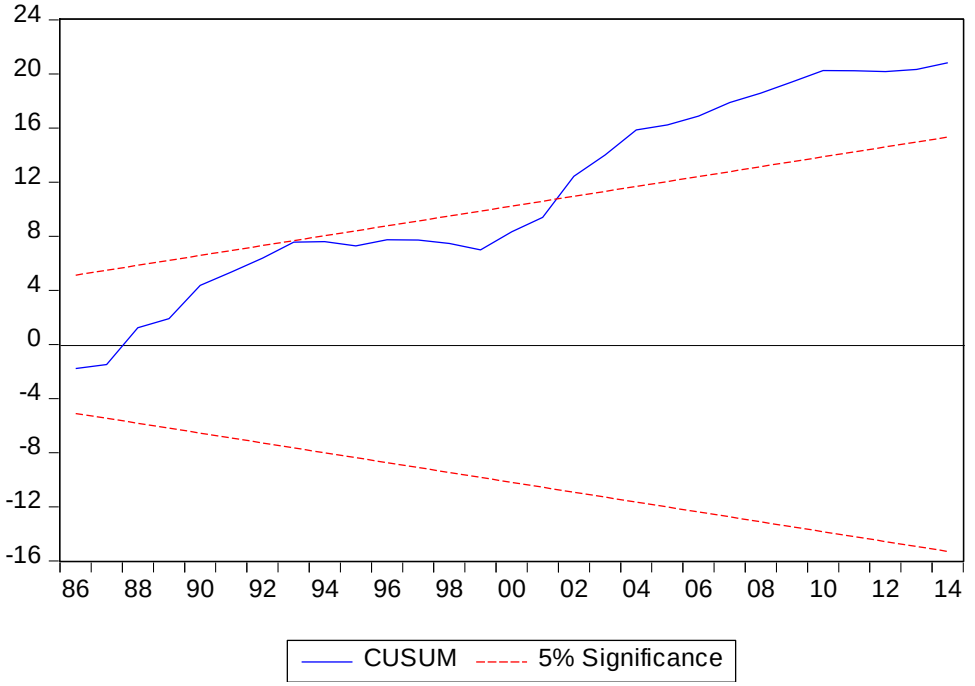
Nigeria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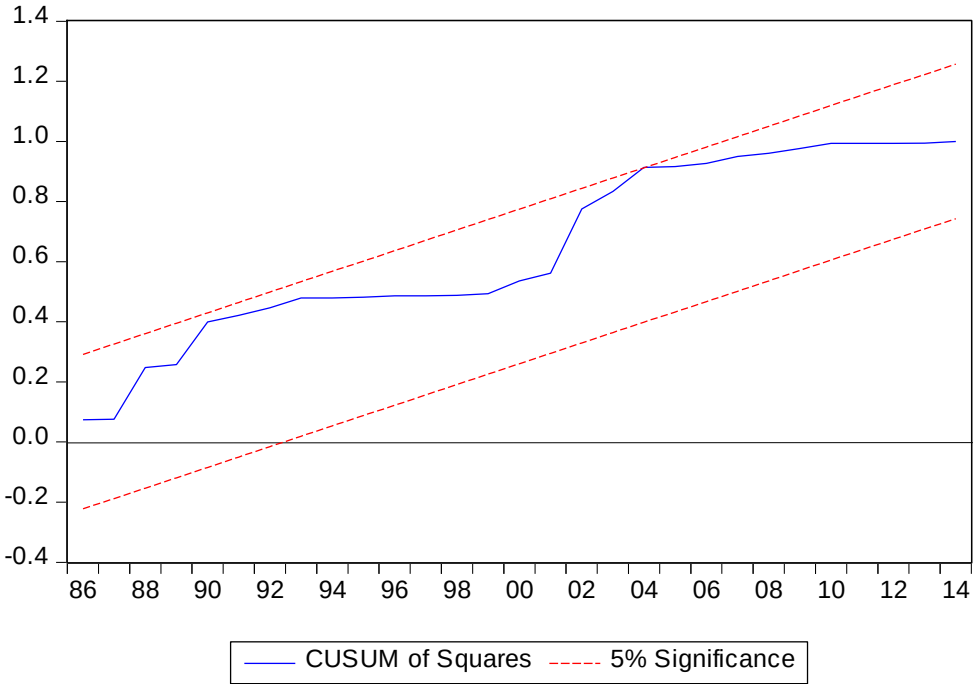
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CUSUM of Squares
5% Significance

Sierra Leone